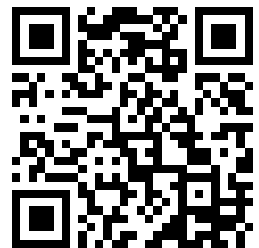

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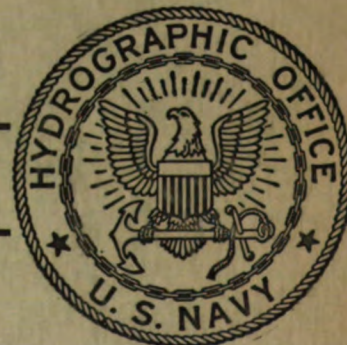
SAILING DIRECTIONS

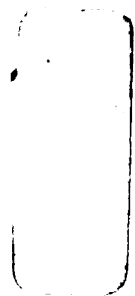


THE BALTIC VOLUME III

H. O. Pub. No. 143

44





H. O. Pub. 44
(Formerly No. 143)

SAILING DIRECTIONS **for the** **BALTIC**

Volume III

Gulfs of Finland and Bothnia

Third Edition
1952

Published by the U. S. Naval Oceanographic Office
under the authority of the Secretary of the Navy



United States
Government Printing Office
Washington : 1952

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Price, including ring binder.....\$5.50
Contents only (without binder).....\$4.00

Change 11

HOW TO KEEP THIS BOOK CORRECTED

As initially published, this book contains material based upon information available in the U.S. Naval Oceanographic Office through the date given in the preface. Subsequently it should be brought up to date by replacing obsolete pages with loose-leaf change pages, which are published at appropriate intervals in consecutively numbered sets called Changes. A later Change does not automatically cancel an earlier Change, therefore each Change must be inserted in sequence as published; eventually the book will contain change pages from several different Changes. A revised List of Effective Pages included in each Change lists the correct pages comprising the complete book. The publication of new Changes, which normally occurs every twelve to eighteen months, is announced in Notice to Mariners. Instructions for ordering Changes will be found in the front part of the book.

In the interval between Changes, informa-

tion that may amend material in this book is published in the weekly Notice to Mariners. The Notice to Mariners number and paragraph number should be marked on applicable pages, as indicated by the page number at the end of each paragraph. Between Changes, the Record of Applicable Notice to Mariners Paragraphs in the front part of this book affords an alternative system for recording the Notice to Mariners numbers (paragraph numbers) opposite each listed page number. This information should also be recorded on the Chart/Publication Correction Record Cards (NHO 5610/2) for the affected pages. The Notice to Mariners should be kept intact and reference made to it as required. Book owners will be placed on the Notice to Mariner mailing list on request to the U.S. Naval Oceanographic Office, Washington, D.C. 20390.

PREFACE

This publication, *Sailing Directions for the Baltic*, Volume III, is the third edition of Oceanographic Office Publication No. 44 (formerly No. 143); as originally published it is corrected to September 13, 1952 (including Notice to Mariners No. 37 of 1952.)

The principal sources examined in the preparation of this edition are:

Svensk Lots, Del III, Stockholm, 1947, and supplement No. 8, 1951.
Svensk Lots, Del II, Stockholm, 1948, and supplement No. 8, 1951.
Svensk Lots, Allmänna Upplysningar, Stockholm, 1940, and supplement No. 10, 1951.
Baltic Pilot, Vol. III, 4th edition, Admiralty, London, 1951.
Ostsee-Handbuch, Nördlicher Teil, Berlin, 1939, and supplement, 1951.
Suomen Rannikon Loistot, Helsinki, 1949, and supplement No. 2, 1951.
Svensk Fyrlista, Stockholm, 1951.
Appendix to Lloyd's Register Book, London, 1951.
The Statesman's Year Book, London, 1951.
Handbook of Baltic and White Sea Loading Ports, Copenhagen, 1948-49.
Northern Shipping Annual, Oslo, Copenhagen, Helsingborg, 1948-49.
Ports of the World, 3d edition, London, 1949.
European Harbour Pilot, 7th edition, Copenhagen, 1948.
United States Consular reports.
Reports from U. S. Naval and Merchant vessels.
Charts, light lists, tide tables, and various documents in the possession of the department.

EXPLANATORY REMARKS

Coastal descriptions.—Beginning with Chapter 2, chapters in this publication are divided into major divisions, or parts, consisting of relatively short sections of coast or of bays or gulfs, islands or island groups, sounds and channels, etc. Major divisions are normally arranged in geographic sequence according to the general plan of the book, and are subdivided, according to subject, into subordinate divisions, which are arranged in the order the various subjects would normally be considered by vessels operating in the area. For example, information normally required for navigating in the offing is given before that required for navigating close inshore, and outer dangers are described before those that fringe the coast. This arrangement makes reference to only the first few paragraphs of each major division covering a particular coast necessary for normal offshore navigation, but progressively more study of the text is required as concern for coastal details increases, as when approaching close-to, entering port, or anchoring. The subordinate divisions are appropriately titled to aid in locating specifically required information, and their arrangement is designed to eliminate comprehensive reading if the various inshore details of a coast are of no concern.

Graphic indexes.—A general index diagram showing the area described in this publication and the general limits of the various chapters is located in the front part of the book. An individual chapter index program showing an enlargement of the specific area described is located at the beginning of each chapter. These chapter indexes also show the limits of the

PREFACE

best-scale charts issued to United States naval vessels by the Oceanographic Office and indicate the place in the text where a description of various designated localities begins. To find the description of a particular locality, simply refer to the general index to determine the appropriate chapter index, which will indicate by means of section numbers the place in the text where a description of the area that includes the particular locality begins.

Bearings are true, and are expressed in degrees from 000° (north) to 360°, measured clockwise. Bearings limiting light sectors are toward the light.

Courses are true, and are expressed in the same manner as bearings. The directives "steer" or "make good" a course mean, without exception, to proceed from a point of origin along a track having the identical meridional angle as the designated course. Vessels following the directives must allow for every influence tending to cause deviation from such track, and navigate so that the designated course is continuously being made good.

Courses given throughout the text under the heading "Navigation" are as plotted on the best-scale chart of the locality, and they simply indicate a track that may be followed along the coast being described to avoid grounding. From suitable points on these coastal tracks, courses to ports or other places in the area are given wherever appropriate.

Distances are expressed in nautical miles of 1 minute of latitude, or approximately 2,000 yards. Distances of less than 1 mile are expressed in yards or fractions of a mile. Decimals are occasionally used.

Wind directions are the true directions from which winds blow.

Current directions are the true directions toward which currents set.

Charts shown on the graphic indexes at the beginning of each chapter are the largest scale charts of the locality on issue to the United States naval vessels by the Oceanographic Office. The H.O. Index-Catalog of Nautical Charts and Publications shows complete Oceanographic Office chart coverage.

Geographic positions given at intervals throughout the text are approximate only and are intended to facilitate reference to the charts.

Depths are referred to chart datum and are expressed in fathoms or feet and meters.

Heights are referred to the plane of reference used for that purpose on the charts and are expressed in feet.

Light and fog signal characteristics are not described, and light sectors are not usually defined. The Light Lists should be consulted for complete information.

Radio navigational aids and radio weather services are not described in detail. H. O. Publications Nos. 117A and 118 (formerly 205 and 206) should be consulted.

Geographic names are generally those used by the nation having sovereignty. Names in parentheses following another name are alternate or obsolete names that may appear on some charts. In general, alternate, or obsolete names are quoted only in the principal description of the place.

Corrective information.—It is requested that the U.S. Naval Oceanographic Office, Washington, D.C. 20390, or any of its branch offices, be advised of any inaccuracy found in this publication or of additional navigational information considered appropriate for insertion. Various Oceanographic Office forms are available for this purpose.

Short Corrections.—formerly used to maintain this publication, are now being incorporated in the change pages to eliminate hand corrections by the user. If short corrections are found to be necessary in the future, a page of instructions for their use will be furnished at the time of publication.

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CHAPTER LIMITS



CHAPTER LIMITS—PUB. NO. 44

CHANGE
7

VII

(Formerly page III) Pub. 44

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RECORD OF CHANGES TO H.O. PUB. 44 THIRD EDITION, 1952

[illegible]

Note.—This page has been renumbered and re-located accordingly. Transfer recorded data to this new page before discarding the old page.

CHANGE IX
7

(Formerly page VII) H. O. 44

HOW TO OBTAIN CHANGES

Sales to General Public.—When this book is sold, all Changes in effect at the time are furnished at no extra cost. Subsequent Changes have a standard selling price of 35 cents each. Whenever possible, Changes should be bought from one of the local sales agents listed in Part I of the Catalog of Nautical Charts and Publications. If there is no sales agent available, Changes may be ordered by mail from the U.S. Naval Oceanographic Office, Washington, D.C., 20390 or from either of the Distribution Offices listed below. Such orders must be accompanied by check or money order made payable to the U.S. Naval Oceanographic Office. Postage stamps or Government Printing Office coupons cannot be accepted as payment. Changes will be mailed, postage paid, by regular mail. Special handling costs, such as air mail, special delivery, etc., must be borne by the purchaser.

In emergencies, Changes may be bought from one of the Branch Oceanographic Offices also listed in the catalog. Branch Offices do not handle mail orders.

Official U.S. Government Issues.—U.S. naval vessels and government activities on official distribution lists will receive Changes automatically upon publication. Government

activities not on the distribution lists should submit requests to the U.S. Naval Oceanographic Office, Washington, D.C., 20390 or to one of the Distribution Offices.

Mail orders from the Pacific Ocean area or west of the Mississippi River, except the Gulf of Mexico and the Canal Zone, should be sent to:

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H.O. 44—Change 10 XI

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LIST OF EFFECTIVE PAGES

H.O. Pub. No. 44 — Third Edition, 1952
Change No. 10

This list supersedes any previous list. If two or more Changes are to be applied at one time, only the latest list should be used.

EXPLANATION

- 19 Original book page. Only odd-numbered pages are listed; their reverse sides are taken for granted unless otherwise noted.
- 19-3 Change page from Change No. 3. It replaces previously effective page 19.
- 20a-3 Additional book page included in Change No. 3. Pages 20b, 20c, etc., if included, are inserted in alphabetical order.

PAGES REQUIRED IN COMPLETE BOOK

Title Page-9	VII-7 (Rev. Blank)	XIII-10
III-10	IX-7 (Rev. Blank)	XV-10 (Rev. Blank)
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Continued on reverse side

LIST OF EFFECTIVE CHANGES

This list supersedes any previous list. The effective pages of each listed Change must be applied to bring this publication up to date. Previous Changes not listed are no longer effective.

Change 8 has been canceled by this change.

Change No. 7, corrected through Notice to Mariners 23 of 6 June 1964
Change No. 9, corrected through Notice to Mariners 4 of 27 Jan. 1968
Change No. 10, corrected through Notice to Mariners 45 of 9 Nov. 1968

LIST OF EFFECTIVE PAGES

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447-10	Envelope containing
449-10	route and index chart

Pages 19, 499 thru 505 and 511 have been discarded by previous changes.

THE SHORT CORRECTION SYSTEM

Although Change pages replacing obsolete pages represent the ideal correction system for loose-leaf books, the Short Correction system is used as a reasonable alternative when corrections are too small to justify replacing an entire page.

Short Corrections are intended to be kept intact in the front of the book for ready reference as needed. The previous option of cutting apart and pasting Short Corrections to affected pages has been discontinued in the interest of simplicity. Previous Short Corrections that remain effective are repeated in subsequent Changes, and both old and new corrections for any given page are grouped together for easy reference. Pages affected by Short Corrections that are new with this Change are listed below. It is recommended that the top of each affected book page be marked "See Short Corrections" as a reminder that a Short Correction applies.

Short Corrections are preceded by a code group which shows the applicable page number, column, line number, and first word of line affected. Unless otherwise indicated each Short Correction replaces the entire line or lines designated. Exceptions are self-explanatory.

Example: 429-L-10 (Island). The Short Correction applies to Page 429, left column, line 10. "Island", the first word of line 10, serves as a check on the line count.

NEW SHORT CORRECTIONS IN THIS CHANGE

Short Corrections that are new with this Change apply to the following pages, which should be marked as suggested above.

Pages: 13, 73, 231, and 329.

CUMULATIVE SET OF SHORT CORRECTIONS

13-Cardinal System-Cross Buoys: For "(Amber)"; read "(Green)". (Chg. 9)

13-Lateral System-Detached Danger Buoys: For "(Amber)"; read "(Green)". (Chg. 9)

13-Lateral System-Bifurcational and Conjunctional Buoys: For "(Amber)"; read "(White)". (Chg. 9)

73-Graphic Index: Delete B.A. 2279 and chart limits. (Chg. 8)

73-Graphic Index: Delete B.A. 2227. (Chg. 8)

73-Graphic Index: For SEC. 2C15 read SEC. 2C-15. (Chg. 9)

107-Graphic Index: Delete B.A. 2279 and chart limits. (Chg. 8)

107-Graphic Index: For PORKKALANSELKA, SEC. 3A-20 read PORKKALANSELKA, SEC. 3A-21. Chg. 8)

- 107-Graphic Index: For KALLBADAGEUND read PORKKALAN KALLBADA. (Chg. 8)
- 115-Hanko (Meijerfelt Light) (Submarine cable): Delete. (Chg. 6)
- 163-Graphic Index: Delete B.A. 2279 and chart limits. (Chg. 8)
- 163-Graphic Index: For LENINGRAD LIGHT VESSEL read LENINGRAD APPROACH BUOY. (Chg. 8)
- 183-Graphic Index-Change: (See H.O. Pub. No. 142 to read (See H.O. Pub.43) (Chg. 6)
- 209-Delete: (Customhouse - Harbor Master) (and symbol)
- 211-Graphic Index-Change: (See H.O. Pub. No. 142) to read (See H.O. Pub. 43) (Chg. 6)
- 231-Graphic: Delete B.A. 3435 and chart limits (in 4 places). (Chg. 9)
- 329-Graphic: Delete B.A. 3435 and chart limits (in two places). (Chg. 9)

Note: Information about special United States regulations, signals, rescue operations, and other cautions previously contained in Chapter I of this text is now included in Notice to Mariners No. 1 of each year.

- 84-L-14 thru 28 (Anchorages): Delete. (Chg. 8)
- 84-R-9 thru 10 (them): them on that bearing (Chg. 8)
- 86-R-1 thru 5 (There): There is a floating drydock, with a lifting capacity of 9,500 tons, in Tallinn Harbor. Diving equipment is available. (Chg. 8)
- 86-R-30 (2B-1):
2B-1 Rokhonem (Rohu Neem) (59°34'N., 24°48'E.), (Chg. 8)
- 99-L-8 thru 10 (most): most rocky patch of Diamond Bank. (Chg. 7)
- 99-L-11 (Two):
Two shoal patches, Provodnik and Zapal (Banka Zalal), (Chg. 8)
- 99-L-16 thru 17 (Zapal): Delete. (Chg. 8)
- 99-L-18 thru 20 (Zmel):
Zmel (Banka Zmey) a shoal with a depth of 4 3/4 fathoms lies about 3 1/4 miles east- (Chg. 8)
- 103-R-5 (5 1/2): 5 1/2 miles south-southwestward of Mys Kolgangya. (Chg. 8)
- 103-R-12 (naval) After line 12 add:
It has been reported (1965) that a major part of the Rutchi port area is in a state of disrepair and has been abandoned. (Chg. 8)
- 104-L-15 (Mys): Mys Kolgangya and Mys Ust'inskiy (Mys Usmyskiy), a low (Chg. 8)
- 104-L-39 (Peipio): Peipio (Peypiya), about 7 1/2 miles southeastward, is (Chg. 8)
- 104-R-11 (Mys):
Mys Dubovski (Mys Dubovskiy), is situated about 7 1/2 miles (Chg. 8)
- 104-R-22 (the): the Susta Reka (Sista Reka) flows into the bay. Foul (Chg. 8)
- 104-R-25 (At):
At Uste (Ust'ye), about 2 1/4 miles southeastward (Chg. 8)
- 105-L-2 (much): much as 1 1/2 miles offshore. At Mys Osinova (Mys Osinovyy), (Chg. 8)
- 105-R-10 (Prijimova):
Prijimova (Banka Prizhimova), a 14-foot shoal, lies about 1 1/4 (Chg. 8)
- 107-Graphic Index: Delete B.A. 2279 and chart limits. (Chg. 8)
- 107-Graphic Index: For PORKKALANSELKA, SEC. 3A-20 read PORKKALANSELKA, SEC. 3A-21. (Chg. 8)
- 107-Graphic Index: For KALLBADAGRUND read PORKKALAN KALLBADA. (Chg. 8)
- 110-L-44 (mile): mile northward of Russaro Light. This (Chg. 7)
- 110-R-39 thru 40 (of Russaro): of Russaro and is marked by a lighted buoy and by spar buoys. A spar (Chg. 8)
- 110-R-50 (shoals) After line 50 add:
A light buoy is moored about 1 mile south-southeastward of Ajax Shoal. (Chg. 8)

111-L-29 (eastward): eastward, 1/3 mile eastward, and 1 1/3 miles (Chg. 8)

111-R-37 (here): here a course of 320° leads toward the (Chg. 7)

111-R-44 (mentioned): mentioned above. From here a course of 320° (Chg. 7)

112-R-28 (close) After line 28 add:

Meijerfelt range lights in line 327°, located on Meijerfelt Islet and the mainland, lead from seaward to the Metsanhakkaus range. (Chg. 8)

112-R-41 (A pair): A pair of lights in range 60° stands on Tul- (Chg. 7)

112-R-44 (A pair): A pair of lights in range 274 1/2° is shown from. (Chg. 8)

113-L-43 thru 44 (den): den. (Chg. 8)

113-R-3 thru 9 (and): with Meijerfelt range lights in line 327°, passing eastward of Russaro, to a position about 1 mile southeastward of Gustavsvärn where Metsanhakkaus light and beacon come in range 320°; thence to a position about 1/2 (Chg. 8)

113-R-17 thru 18 (3A-14):

3A-14 Hanko is located on the eastern side of (Chg. 8)

115-Hanko (Meijerfelt Light) (Submarine cable): Delete. (Chg. 6)

117-R-49 (ward) After line 49 add:

In 1964, a local magnetic anomaly was reported about 4 miles eastward of Svartbadan Light. (Chg. 8)

118-L-5 thru 6 (the island): the island. A (Chg. 8)

119-L-15 (anchorage): anchorage on the eastern side of Traskon (Stor Trasko). (Chg. 8)

119-R-8 (an) After line 8 add:

Kantvik (60°05'N., 24°23'E.), a town located on the northeastern end of the bay which lies eastward of Pikkalaffard, is the site of a sugar refinery and pier. The pier is 360 feet long with a depth of 31 feet alongside. The fairway from the Gulf of Finland to Kantvik, marked by ranges and buoys, has an official depth of 30 feet. An 18-foot channel continues northward to the pier at Batvik located at the head of the bay. (Chg. 8)

119-R-40 (ward): ward and southwestward of Makilo (Makiluoto) and also (Chg. 8)

121-R-5 (Ryssankari):

Ryssankari (Rysakari) lies about 3 2/3 miles northeast- (Chg. 8)

124-L-33 (in) After line 33 add:

A submarine water pipeline extends from the southwestern extremity of Santahamina to the northern coast of Isosaari. (Chg. 8)

124-R-8 thru 17 (3B-7):

3B-7 The following is a summary of the harbor (Chg. 8)

131-L-15 thru 16 (be): be obtained at Helsinki or the pilot station on the southern extremity of Emasalo (sec. 3B-16), if using the fairways through the islands. (Chg. 8)

131-L-17 (Soderskar): Delete. (Chg. 8)

XX

- 131-L-19 (vessels) After line 19 add;
Pilots meet vessels from seaward about 3 miles north-northwestward of Kalbadagrund Light (sec. 3B-15) (Chg. 8)
- 131-R-13 (3B-18):
3B-18 Pellinge (Suur Pellinki) (60°12'N., 25°50'E.) (Chg. 8)
- 131-R-21 thru 24 (ward): ward of Kalbadagrund. (Chg. 8)
- 132-L-21 (Kajavsalo):
Kajvsalo (Kejvsalo), a large island in the middle of (Chg. 8)
- 132-L-38 (Hamnholmar): Hamnholmar (Hamnholm) and Skarven. Lights are shown (Chg. 8)
- 132-R-28 (signal): signal is sounded at the light. Light reported destroyed 1965. A spar buoy (Chg. 8)
- 132-R-47 (from): from the eastern end of the island. A radiobeacon transmits and a fog signal is sounded on Orregrund. A line- (Chg. 8)
- 133-L-7 (Ljusan):
Ljusan (Ljusaro) lies about 2 miles north-northeast- (Chg. 8)
- 133-L-41 (ing): ing between them; light and spar buoys mark the ad- (Chg. 8)
- 134-R-32 thru 37 (has): has 312 feet of berthing space for drafts of 18 feet along the western side of Etela Laituri (South Quay); 427 feet of berthing space for drafts of 24 feet along the eastern side of Etela Laituri; 443 feet of berthing space for drafts of 24 feet alongside Viistolaituri (Connection Quay); and 525 feet of berthing space for drafts of 10 1/2 feet alongside Valilaituri (Middle Quay). Work is in progress (1963) to increase the total berthing space available at Valilaituri to 919 feet. Construction of more berthing space is being planned at Hiililaituri (Coal Quay). Loviisa has a 260-foot pier with a depth (Chg. 7)
- 135-L-18 (light): light is shown on the island. A submarine ca- (Chg. 5)
- 135-L-26 thru 27 (ground): ground. Lights are shown from two islands on the foul ground about 1/2 (Chg. 7)
- 135-R-11 (Luojerunnit):
Luojerunnit (Luodematalat), a bank with depths less than (Chg. 8)
- 136-L-15 (eastward): eastward of Boisto. Munapirrti (Morgenporto) extends north- (Chg. 8)
- 136-R-34 (5-fathom): 5-fathom shoal lies about 2 miles east- (Chg. 8)
- 137-R-3 (Rankki):
Rankki (Rankinsaari), an island, lies about 4 miles south- (Chg. 8)
- 137-R-15 (and): and the northern end of the foul ground.
Retonpaasi, a rock awash on which a light is shown, lies about 1 1/2 miles eastward of Rankki Light. (Chg. 8)

140-R-35 (saari) After line 35 add:

An overhead cable with a vertical clearance of 110 feet extends southward from Hietanen; spanning the channel between Hietanen and Kotka Island. (Chg. 8)

143-Graphic Index: Change "New Pier" to "Valilaituri Pier". (Chg. 5)

143-Graphic Index: Change "Haranniemi" to "Harniemen". (Chg. 5)

144-L-2 (Berths) After line 2 add:

Oil berth, 33 feet. (Chg. 8)

144-L-25 (to): to 27 3/4 feet alongside. There is a depth of 33 feet at the Oil Pier. The inner harbor (Chg. 8)

144-L-36 (stead): stead and to the oil installation pier on the southeastern point of Hillonniemi. The approach fairways are described (Chg. 8)

144-R-37 (marked): marked by spar buoys.

At the Oil Pier, located southward of Lakulahti, vessels anchor stern to the pierhead and secure to mooring buoys. (Chg. 8)

146-L-3 (mile): mile northeastward. A light is shown on Norskari. Two beacons on the (Chg. 8)

146-R-48 (10 feet) After line 48 add:

Oil Pier: depth in berthing area 33 feet. (Chg. 8)

146-R-51 (nects) After line 51 add:

An ice-breaker is stationed at Hamina. (Chg. 8)

147-L-2 thru 3 (stores): stores are procurable. Bunker fuel and diesel oil are available at Kotka (sec. 3C-16). Water is delivered by waterboat. (Chg. 5)

147-R-31 (Pitkanen):

Pitkanen (Banka Pitkyanen) and City Rock, about 1/4 mile (Chg. 8)

147-R-38 thru 39 (Both): Cityrock is marked by a spar buoy. (Chg. 8)

147-R-40 (Ostrov):

Ostrov Vidskyaren (Kiuskeri) (Fiskar) (60°24'N., (Chg. 8)

148-L-11 thru 12 (of them): of them. A light is shown on Ostrov Vidskyaren. (Chg. 8)

148-L-15 (Ostrov):

Ostrov Galli (Halli) (Khalli) is a steep-to rock (Chg. 8)

148-L-27 thru 28 (Ruis):

Ruis Matala, a shoal area with depths of 3 to 5 feet, lies about 2 1/2 miles east- (Chg. 6)

148-R-6 (depth): depth of 6 fathoms (Chg. 6)

149-R-26 thru 28 (Parrio):

Parrio and Santio (60°28'N., 27°43'E.) are adjacent islands, their western and northwestern sides (Chg. 8)

150-L-7 (in): in range 263 1/2° is shown from this islet and (Chg. 8)

150-L-19 (the) After line 19 add:

A seal rookery has been established southward of Huovari. The international boundary is the western limit of the area which is marked by buoys. See section 2C-6. (Chg. 8)

150-L-35 (3D-6):

3D-6 Ul'ko-Matala and Okhta-Matala (Banka Otamatala), with (Chg. 8)

150-R-12 (Ostrov):

Ostrov Pukkion-Sari (Ostrov Pukkio) is an island on the (Chg. 8)

152-R-11 (3E-1):

3E-1 Mys Kryuserot (Mys Ristniyetl) (Ristinleml) (Mys (Chg. 8)

154-R-12 (but): but between Ostrov Revonsari (Lisly) (Ostrov Rivansari), which (Chg. 8)

157-Graphic: Reports indicate major changes in piers, quays and port facilities. See text section 3E-7. (Chg. 8)

158-L-27 (feet): feet, and draft forward of 8 feet and aft of 12 feet. A floating drydock with a lifting capacity of 3,000 tons is available. (Chg. 8)

158-L-53 (from): from the point. A light buoy is moored at (Chg. 8)

158-R-7 (to): to (Kovisto), and Torsaari, lie close together and front (Chg. 8)

158-R-9 (miles): miles. Proliv Koyviston (Koyvoston) Salmi lies between the (Chg. 8)

160-L-20 thru 23 (Fishing): Delete (Chg. 8)

160-L-34 (westward) After line 34 add:

An area prohibited to anchorage and fishing lies about 3 miles southward of the southern extremity of Ostrov Torsaari. (Chg. 8)

160-L-46 (A lifesaving):

A lifesaving station is located on Mys Pitkanyiyemi. (Chg. 8)

160-R-1 thru 4 (kyaniyemi): Delete. (Chg. 8)

160-R-30 thru 34 (Fishing): Delete. (Chg. 8)

163-Graphic Index: Delete B.A. 2279 and chart limits. (Chg. 8)

163-Graphic Index: For LENINGRAD LIGHT VESSEL read LENINGRAD APPROACH BUOY. (Chg. 8)

166-L-31 (4A-1):

4A-1 Ostrov Karavaldy (Shepelev) (Shepelevskiy) (Chg. 8)

169-R-10 thru 11 (Fort): Fort and is marked on its northern and southern sides by lighted whistle buoys with radar reflectors. The northern and southern sides (Chg. 5)

170-L-36 thru 39 (Note): Delete. (Chg. 5)

172-L-12 (Directions): Directions.—From Leningrad approach buoy (Chg. 5)

172-R-2 (4B-9): 4B-9 Leningrad approach buoy.—See sec- (Chg. 5)

175-L-10 thru 13 (1961): (1964) the limiting draft in Leningrad was 29 feet, this may be reduced by easterly winds. Dredging is required to maintain a project depth of 30 feet in the Morskoy Kanal. (Chg. 8)

175-L-22 thru 24 (a white): a white median band. One pair of light buoys is moored about 1/2 mile within the western entrance. A pair of lighted bell buoys is moored 4 1/2 miles from the west- (Chg. 8)

175-R-33 (ted): ted in the open part of the channel is 10 knots, (Chg. 7)

177-L-30 thru 31 (of): of Mys Styursudd. A light is shown on the point. There is a landing pier and shelter for (Chg. 8)

183-Graphic Index-Change: (See H.O. Pub. No. 142 to read (See H.O. Pub. No. 43) (Chg. 6)

187-L-42 thru 43 (Range): Delete (Chg. 8)

190-L-5 thru 6 (available): available at Uto and Nyhamn for 29 1/2-foot and 27-foot drafts, respectively, and at Ko Karsfjard for 21-foot drafts. (Chg. 6)

190-R-16 (on): on Flotjan and Lagskar. (Chg. 8)

193-L-1 thru 2 (ward): ward of Bjorkor. Vastra Fastor, a rock, lies about 1 1/2 miles (Chg. 8)

193-R-7 (Lango): Lango. Fairways for 12-foot drafts lead into (Chg. 8)

194-R-13 (and): and there is a depth of 20 feet alongside the face. (Chg. 8)

195-R-23 (Marhallan): Marhallan (Marhallen) (60°02'N., 19°52'E.), a rock (Chg. 7)

195-R-32 thru 34 (A light): Delete (Chg. 7)

205-L-31 (ches): ches marked by light buoys and spar buoys. Lighted bea- (Chg. 8)

210-L-22 thru 25 (Linnanaukko): Linnanaukko: berthing length, 4,200 feet; depths alongside 19 to 29 1/2 feet. Berths are the chief point for general cargo handling in the main harbor. Cranes available: fourteen 5- to 6-ton, (Chg. 8)

210-L-31 thru 32 (chief): chief cargoes handled. Three 6-ton cranes and a 60-ton crane are available. (Chg. 8)

210-L-36 (length): length of about 1,500 feet with depths of 14 to 21 feet alongside; those (Chg. 8)

210-R-4 thru 6 (Oil):

Oil harbor, immediately eastward of Pansio, has two berths, each about 500 feet in length with a depth of 29 1/2 feet alongside the southeastern side of the pier and 21 feet alongside the northwestern side. A 30-ton floating crane is available (Chg. 8)

211-Graphic Index-Change: (See H.O. Pub. No. 142) to read (See H.O. Pub. No. 43) (Chg. 6)

222-R-34 (near) After line 34 add:

Skogsskar Light is shown on the southwestern end of an island about 1 1/2 miles northeastward of Rastensudde Light. (Chg. 8)

227-L-38 thru 40 (trance): trance point of Oregrundsgrepen. A radiobeacon transmits from the light. (Chg. 8)

233-R-16 thru 17 (to): to a position about 1 1/2 miles southeastward of Sydostbrotten Light (sec. 9A-3). This (Chg. 7)

234-L-21 thru 23 (westward): westward. (Chg. 5)

237-R-23 (range): range lights, in range 216°. This range leads (Chg. 8)

239-L-44 (with): with a least depth of 17 feet, and Hundra an 11-foot patch lie about 1 1/2 (Chg. 8)

243-R-50 (mainder): mainder 18 feet. A new oil pier with a project depth of 36 feet is under construction; scheduled completion date 1965. (Chg. 8)

249-L-2 (Storjungfrun): Storjungfrun Light. A light is shown at Fabovallshararna a (Chg. 8)

251-L-32 thru 44 (hallan): hallan Light. The buoyed channel leading southward of Otterhallan Light is marked by a lighted range, the forward light is shown close southeastward of Brandskar and the rear light is shown about 1,000 yards farther westward. From Brandskar Light to Sod- (Chg. 8)

251-R-4 thru 15 (From): Delete (Chg. 8)

256-L-11 (to): to a depth of 24 1/2 feet, and marked by spar (Chg. 8)

256-L-17 (15 1/2): 12 feet; it is marked by spar buoys and (Chg. 8)

260-R-15 thru 17 (A): A lookout is maintained on Ingaskar. Pilots board incoming vessels outside Britas Kack during daylight hours only. From the 1st of May to the 30th of September pilots are on duty from 0500 to 1900. (Chg. 8)

261-R-15 thru 16 (obtained): obtained from Holick, Stocka Hamn, or Spikarna. (Chg. 8)

261-R-34 (can): can be obtained from Spikarna. (Chg. 8)

262-L-7 (Pilots): Pilots can be obtained from Spikarna. (Chg. 8)

262-L-29 thru 31 (200): 200 yards of these cables. (Chg. 8)

262-R-20 (anchor) After line 20 add:

A bridge with a vertical clearance of 131 feet spans Alnosundet about 3 miles northeastward of Sundsvall. The 230-foot channel between the bridge pillars is marked by lights. (Chg. 8)

263-L-24 (eastward): eastward of Skigan. Red spar buoys, each (Chg. 5)

263-L-31 thru 34 (depth): depth of 1 1/2 fathoms lies about 1 1/2 miles north-northeastward of Graskarsbadan. A black spar buoy is moored about 1/2 mile eastward of it. A 2-foot patch and a 4 1/4- (Chg. 6)

264-R-25 (structure): structure is equipped with a radar reflector.

A light is shown at Spikarna, a fishing harbor, about 2 1/2 miles northeastward of Draghallan Light.

Gubben Light and Rodogubben Light are shown on islands of the same names about 4 miles east-northeastward and 5 miles northeastward, respectively, of Draghallan Light. (Chg. 8)

264-R-29 thru 32 (ward): ward of the lighthouse. (Chg. 8)

271-R-8 (obtained): obtained from Spikarna. (Chg. 8)

271-R-14 (obtained): obtained from Spikarna or Harnosand. (Chg. 8)

272-L-25 (small) After line 25 add:

Obstruction lights are shown on a radio mast which stands about 3 1/3 miles north-northeastward of Storholmen Light. (Chg. 6)

279-L-21 thru 22 (westward): westward of Frano, has about 2,800 feet of quayage with depths up to 26 feet along- (Chg. 8)

280-R-30 (joberget): joberget (sec. 7E-7) leads eastward of that (Chg. 7)

283-L-22 (proceed) After line 22 add:

Vessels are not to exceed a speed of 7 knots in Ulvosundet. (Chg. 8)

285-R-16 thru 18 (12 1/2): 12 1/2 to 34 feet. Vessels up to 650 feet in length with a draft of 31 feet can be accommodated. Provisions and water can be obtained. Fuel oil and diesel oil are supplied by tank truck. Minor repairs can be effected. There is a doctor in the port. Pilots are obtained from (Chg. 5)

285-R-19 (Norra): Norra Ulvon or Skagsudde. Ice usually (Chg. 8)

286-L-10 (fjord) After line 10 add:

Mines have been laid, westward of Malmon and southward of Buron, in the approaches to Ornskoldsvik. Anchoring and fishing are prohibited in the area. (Chg. 8)

288-R-20 (a position): a position about 2 1/4 miles east-northeast- (Chg. 8)

288-R-40 thru 43 (Pilots):

Pilots.—For (Chg. 6)

289-L-19 thru 26 (Vessels): Delete (Chg. 8)

291-L-9 (Light): After line 10 add: A fog signal is sounded at the light (Chg. 8)

291-L-21 (the wharf) After line 21 add:

A number of obstruction lights are shown occasionally in Northolmen. (Chg. 4)

291-L-25 (dan): dan both by day and night. Vessels with a draft in excess of 22 feet are not allowed to enter or leave Rundvik during hours of darkness. (Chg. 5)

291-R-1 (stores): stores, provisions, fuel oil, diesel oil, and water can be obtain- (Chg. 5)

295-L-26 (1 mile): 2 miles north of Storbrotten Lighted Whistle Buoy (Chg. 7)

296-L-29 (8A): 8A-1 Enskar (Isokari) (60°43'N., 21°01'E.) is (Chg. 8)

296-R-29 thru 30 (Lyokki): the tower on Sandbacks Norra, about 8 1/2 miles west-northwestward of Enskar, Lyokki Tower, about 13 1/2 miles north-northwestward of Enskar, Rihliniemi, 10 1/2 miles north- (Chg. 7)

297-L-38 (marked): Delete (Chg. 8)

301-L-6 thru 8 (ward): ward of Lyokki Tower. Vessels from seaward may obtain pilots at Enskar. Pilots are available at Heponiemi. Pilotage is compulsory. (Chg. 8)

306-R-4 (is compulsory): is compulsory. Vessels from seaward embark pilots about 3 miles northwestward of Kylmapihlaja. Vessels approaching by the inner channels may obtain pilots at Reposaari. (Chg. 8)

308-R-8 thru 15 (Pastuskeri): Delete (Chg. 8)

311-L-13 (lies): lies about 3/4 mile further northeastward. (Chg. 8)

312-L-14 thru 17 (Depths:) Depths: Approach channel 26 feet. Anchorage, 23 and 29 feet. At quays, 13 to 26 feet. (Chg. 8)

312-L-39 thru 44 (Other):

The entrance channel was dredged to a depth of 26 feet (1963).

Harbor depths range from 18 to 26 feet. (Chg. 8)

312-R-42 thru 43 (of): of the northern side of Visakkaniemi. (Chg. 8)

313-L-1 thru 2 (its): Delete (Chg. 8)

313-L-23 (luoto): luoto (Chg. 8)

313-L-37 (Vessels):

Vessels bound to (Chg. 8)

317-L-15 (in range): in range 073°. (Chg. 8)

323-L-44 (In):

In 1963 the population was about 1,500. (Chg. 8)

323-R-5 (26 feet): 23 feet at the northern end. Deep Harbor Quay has (Chg. 8)

323-R-12 thru 13 (no): no drydocks or shipyards. (Chg. 8)

326-L-33 thru 35 (A light):

A light is shown on the northern extremity of Gashallan (sec. 8C-6),(Chg. 8)

332-L-30 (from): from Sydostbrotten Light (sec. 9C- (Chg. 7)

332-R-11 (of): of Bonden.

Caution.—Approaching Bonden within 1/3 mile between April 15 and August 1 is forbidden except in case of need or authorized permission. (Chg. 7)

332-R-41 thru 48 (southeastward) southeastward of Bonden; Sydostbrotten Light is shown, a fog signal is sounded and a radiobeacon is operated from a tower standing on the shoal. (Chg. 7)

334-L-20 thru 21 (ward): ward to a position about 1 1/2 miles southeastward of Sydostbrotten Light, see (Chg. 7)

334-R-15 (about): about 1 1/2 miles southward of Storhallan. The pilot station is equipped with radar and radiotelephone. (Chg. 8)

335-L-41 thru 45 (harbor): harbor with the eastern point of Storklubb in range 357° with the houses at the head of the harbor. When about 1 1/4 miles southward of the islet alter course to 000° and enter on the approach range. Pass westward of the 3- (Chg. 6)

336-R-10 thru 13 (and marked): lies about 1 1/2 miles east-northeastward of Snoan Light; Olov Ersgrund, with a depth of 3 1/4 fathoms and marked on its eastern side by a spar buoy, lies about 3/4 mile farther east- (Chg. 6)

342-L-40 (patch): patch, marked by a spar buoy, lies about 1/4 mile southeastward of the (Chg. 7)

342-R-21 (buoy): buoy with a radar reflector and a lighted buoy, lies on the north- (Chg. 8)

343-L-5 (Trehovda):

Trehovda, a shoal with a least depth of 3 1/2 (Chg. 5)

343-R-11 thru 16 (channels): channels leading into Holmsund. Two lights in range 335°, shown on Hillskar, mark the channel from seaward to the entrance of the Bredskar range. (Chg. 8)

343-R-45 (tion): tion 1-25. The pilot station is equipped with radar and radio-telephone. (Chg. 8)

344-L-3 thru 4 (trance): trance channel should steer for the range lights, located on Hillskar, bearing 335°, this range leads northeast- (Chg. 8)

344-R-22 (A light):

9A-24 A light is shown occasionally from the (Chg. 4)

352-R-3 thru 5 (northeastward): northeastward of Veckargrund. (Chg. 8)

353-R-41 (approach): approach channel, leading northward of Nygrund until Storhasten lighted beacons bearing 141° come in range, thence to the inner reach. (Chg. 8)

355-L-20 thru 23 (northwestward): northwestward of that anchorage. (Chg. 8)

355-L-30 thru 32 (Harbor): Harbor channels, 13- to 25 1/2-foot draft. Berths, 6 to 26 feet. Harbor anchorage, 15 to 26 feet. (Chg. 8)

355-R-38 thru 40 (the harbor): the harbor channels: from a position about 550 yards west-northwestward of the breakwater to the main piers of Vaskiluoto, 25 1/2 feet; to the oil pier in the southern part of Vaskiluoto, 23 feet; to the (Chg. 8)

356-L-5 (have): have depths of 16 to 26 feet alongside; (Chg. 8)

356-L-23 thru 24 (from): from the southwestern side of Vaskiluoto. (Chg. 8)

357-L-5 thru 11 (Vessels): Vessels coming from the northward through the northern inner channels embark pilots at Ritgrund (sec. 9B-10). Pilotage is com- (Chg. 8)

357-L-36 (Steer):

Steer on this range for about 5 miles, pass- (Chg. 8)

357-L-41 thru 46 (close): close northeastward of the buoy marking the northern extremity of Nygrund where the Storhasten lighted beacons come in range bearing 141°, until Storhasten and Nagelprick Lights come in range bearing 112°, thence between Storhasten and Norrahasten Lights. Continue through the buoyed channel passing southward of Nagelprick, thence to the harbor entrance with Nagelprick and Storhasten Lights bearing 292° astern.

Caution.—An unmarked submerged rock lies about 50 yards east-northeastward of Storhasten Light (sec. 9B-9). (Chg. 8)

357-R-1 thru 26 (shoals): Delete (Chg. 8)

357-R-40 thru 52 (Berths):

Berths.—Vaskiluoto harbor has about 2,400 feet of berthing space with depths of 16 to 26 feet alongside the two main piers. (Chg. 8)

358-L-1 thru 2 (Small): Delete (Chg. 8)

358-L-31 (tons) After line 31 add:

Palosaari harbor: (Chg. 8)

369-R-4 thru 5 (arrived): arrived at a position about 5 1/2 miles east-southeastward of Holmogadd (sec. 9C-4) (Chg. 6)

370-R-43 (kar): kar Light and has a least depth of 1 1/2 fathoms. (Chg. 4)

375-R-16 (be): be obtained at Bredskar or Bjuroklubb (Chg. 7)

377-L-22 thru 23 (Vessels): Delete (Chg. 8)

377-R-34 (A pilot): A pilot station, equipped with radar and radiotelephone, is located at Bjuroklubb (Chg. 8)

380-R-16 (ern): ern side of the harbor, in range 275 1/2° lead (Chg. 8)

381-R-27 (two) After line 27 add:

An areolight mast, marked by obstruction lights, is located about 1 mile northward of Noppelberget. (Chg. 8)

385-R-6 (10B-27):

10B-27 Bergskaret (64°48'N., 21°07' (Chg. 6)

385-R-12 (located): located close westward of the light (Chg. 6)

386-L-24 (depths): depths of 17 to 19 1/2 feet alongside. A buoyed channel, marked by range beacons in line 290°, leads to the inner quay. There is (Chg. 8)

386-L-46 (Pilots): Pilots can be obtained from Bjuroklubb, (Chg. 7)

387-L-8 (northeastern) After line 8 add:

A submarine cable is laid from the northwestern extremity of Romelso to Furuogrund. (Chg. 5)

387-L-38 thru 39 (about): about 3/4 mile northward of Romelsohallen, has a 4-fathom patch (Chg. 7)

389-R-42 thru 43 (Falkensgrund):

Falkensgrund, a 5-fathom patch marked by a lighted whistle buoy equipped with a radar reflector, lies about 20 miles south-southeastward of Rodkallen Light (sec. 10C-23).

Svalans Grund, a 4-fathom patch, lies about 15 1/2 miles south-southeastward of Rodkallen Light. (Chg. 8)

390-L-1 thru 5 (and): Delete (Chg. 8)

390-L-10 (of) After line 10 add:

Two lighted buoys, moored about 8 miles south-southwestward of Rodkallen Light, mark the channel between Norstromsgrund and Abelsgrund (see section 10C-24). (Chg. 8)

390-L-17 (11 1/2) After line 17 add:

In 1964 depths of 3 1/2 fathoms were reported close eastward of Grytet. (Chg. 8)

390-L-28 thru 32 (lie): lie in the vicinity of these three dangers. (Chg. 8)

394-L-3 (dish) After line 3 add:

A lifesaving station with rescue craft and line-throwing apparatus is maintained at Romnskar. (Chg. 8)

394-L-28 (these): these dangers, steer to pass about midway (Chg. 8)

394-L-34 thru 35 (of a): of a 3 1/4-fathom patch marked by Renoragrundet Light, lying about 3/4 mile south-southwest- (Chg. 6)

394-R-27 thru 31 (steer): steer for Leskar Light in range 339° with a chimney at Skuthamn, passing west-southwestward of the shoal area extending southward from Stenskar. (Chg. 8)

394-R-43 (Beacon): Beacon bears about 270°, steer 282° for Renoragrundet Light, passing (Chg. 6)

398-R-32 thru 34 (of range): of range beacons, of which the rear beacons are lighted, stand on the southeastern side of Notviken, a bight indenting the northern side of Junkon. Each beacon has a vertical red band on a white rectangular background. A lighted beacon, painted red and surmounted by a white triangle, stands close offshore in a position about 1 1/2 miles northwestward of the paired beacons at the head of Notviken. Stora Skovgrund Range (Chg. 7)

398-R-40 thru 41 (Stora): Stora Skovgrund. A light is shown near the southeastern end of Kalven, an islet (Chg. 7)

400-R-22 (eastern): eastern side. Larsgrundet Light (65°28'N., 22°28'E.) is located about 1 1/2 miles northeastward of the northeastern extremity of Junkon. A fog signal is sounded at the light. A reef, marked at its eastern (Chg. 8)

400-R-27 thru 29 (awash): awash and marked by spar buoys, lies close southward of Vitfagelskar. A 4-fathom patch lies about 1/3 (Chg. 8)

XXX

400-R-32 (Vitfagelskar): Vitfagelskar. Vitfagelgrundet Light (65°29'30"N., 22°26'E.) is located about 2 1/4 miles northward of the northeastward extremity of Junkon. From the eastern side of Ligg- (Chg. 8)

406-R-23 (shown): shown on the northeastern side of the island. A radiobeacon is located at the light. (Chg. 7)

406-R-44 (southward): southeastward of Maloren Light, a 4 1/4-fathom (Chg. 5)

413-L-31 thru 36 (A light): Delete (Chg. 8)

423-L-30 thru 32 (the northern): the northern part of this bank. Other spar buoys, on the (Chg. 7)

423-R-16 (orar): gorar Beacon (Chg. 8)

424-R-27 (vessels): vessels about 1 mile westward of the entrance to the main channel. The pilot (Chg. 7)

429-L-34 thru 41 (harbor): harbor. Exports consist mainly of sawn timber, paper, cellulose, ore, and various lumber products; imports, oil, coal, salt, and fertilizer.

The principal piers are: Ore Pier (The Industrial Harbor), which is also the Oil Pier, has two conveyors rated at 150 tons per hour each and pipelines to the tank farm. Ore pier is about 400 feet long with a depth of 30 feet alongside. Stone Pier, 450 feet long with a depth of 26 feet. Ballast Quay, 170 feet long with depths of 16 to 21 feet, used for loading timber. Customs House Quay, 500 feet long with depth of 27 feet, used for general cargo and as a passenger pier. Oil Pier, southward of the breakwater, berthing space 400 feet with a depth of 30 feet. There are several smaller piers used mainly by pleasure craft. Water and provisions are available, bunkering is done by tank truck. Minor machine repairs can be made at this port. Port area is connected to the main railroad system. All loading is done alongside and there are fixed moorings for vessels awaiting berths. Tugs are available. There is an icebreaker at this port. (Chg. 8)

429-Graphic: The Industrial Harbor (ore pier) is located northeastward of the shoreward end of the breakwater. See sections 11A-15 and 11A-16. (Chg. 8)

429-Graphic: Delete light shown on Hungerberg Island. (Chg. 8)

430-R-12 (pilot) After line 12 add:

A lighted whistle buoy is moored on the edge of foul ground extending about 3 miles northwestward from Ohtakari. (Chg. 6)

431-L-10 (the town): the town in range 108° and 133° lead into (Chg. 8)

432-R-19 thru 22 (southwestward): southwestward of Hanhikivi. Pyhajoki vil- (Chg. 8)

434-L-19 (ing): ing the town will come into view. A 360-foot chimney, marked by obstruction lights, is located about 2 1/2 miles southwestward of the light on Raahe church. (Chg. 8)

434-R-6 (island): island (Chg. 8)

434-R-34 thru 37 (450): 450 yards farther northeastward. (Chg. 8)

435-L-17 thru 24 (Ulkomatala):

Raahe Light is shown on Ulkomatala, a 3 3/4-fathom shoal, located about 5 miles west-southwestward of Iso Kraaseli Beacon. (Chg. 8)

435-L-28 thru 33 (A southern): Delete (Chg. 7)

435-L-42 thru 44 (The more): Vessels with a draft of 4 feet can reach Raahe by the more direct route which passes eastward of Iso Kraaseli (Chg. 7)

435-R-14 thru 21 (11A):

11A-24 Vessels from seaward obtain pilots from Raahe pilot station at Lapaluoto which is equipped with a radiotelephone. Pilotage is compulsory (sec. 1-24). Pilots meet vessels in the vicinity of Raahe Light on Ulkomatala Shoal. Pilots are also available at Marjaniemi pilot station (sec. 11B-18). (Chg. 8)

435-R-25 thru 26 (pass): pass northward of Raahe Light on Ulkomatala Shoal. Steer on this range for (Chg. 8)

435-R-45 thru 46 (channel): channel. (Chg. 8)

437-L-1 thru 2 (southeastward): Delete (Chg. 8)

438-R-1 thru 6 (11B-5):

11B-5 Valimatala is the outer part of a shoal ex- (Chg. 8)

441-L-29 (range): range about 123°. (Chg. 5)

442-L-28 (about): about 4 miles from the light. This track (Chg. 7)

442-R-2 (from): from a lower level of the same structure and a radiobeacon transmits from the lighthouse. (Chg. 8)

445-L-18 (the spar) After line 18 add:

Two lighted ranges, located on the southern side of Vihreasaari, lead into the oil harbor on the western side of Vihreasaari. (Chg. 8)

445-L-26 thru 36 (In):

Toppilan Satama has a total berthing space of about 9,000 feet with alongside depths of 15 to 24 feet. A grain elevator, with a discharging rate of 70 tons an hour, and a cement elevator, equipped with a conveyor for discharging bulk cement rated at 250 tons per hour, are located in Toppilan Satama. The offshore oil berth at Vihreasaari has a depth of 26 feet. It is reported that tankers of 20,000 D.W.T. with drafts up to 27 1/2 feet can use this berth (1965). Nuottasaari has alongside depths of 21 feet. The ore berth is equipped with a conveyor with a loading rate of 500 tons per hour. It is reported (1965) that the ore berth is no longer in use. Pateniemi, used for the export of sawn timber, has alongside berths for coast-wise vessels. Toppilan Satama has cranes with capacities of 3 to 8 tons. It is reported that vessels up to 570 feet in length and with drafts up to 26 feet can be accommodated (1965).

Tugs and lighters are available. (Chg. 8)

446-R-36 (breakwater): breakwater that lies off the western side of (Chg. 8)

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446-R-42 (cated): cated on the southwestern end of Selkasaari, (Chg. 8)

447-L-22 (eastward): eastward of Ajos main pier, when in (Chg. 8)

448-R-7 thru 8 (point): point where Ajos range lights and the light on Kemi church tower come in range (016 1/2°). This (Chg. 8)

448-R-21 thru 22 (approach): approach range about 4 miles south-southwestward of Ajos main pier. From a position on (Chg. 8)

NOTE:

Change H.O. 143 and Pub. 44 to H.O. 44 on the bottom of each page. (Chg. 8)

**RECORD OF APPLICABLE NOTICE TO MARINERS PARAGRAPHS
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This record may be maintained during the interval between consecutive Changes to provide a ready method of locating the Notice to Mariners paragraphs affecting the pages to be used during a voyage.

SUGGESTED USE

a. Note the latest Notice to Mariners through which this publication is corrected. The date and Notice number are indicated on the List of Effective Pages. A new record will be furnished with each change and the old record may be discarded.

b. From the List of Publications affected, which is included in Section I of each Weekly Notice to Mariners, enter the week, year, and paragraph number of all Notice to Mariners paragraphs subsequent to the date in paragraph (a) above, abreast each affected page as follows:

Page	NM	NM	NM	NM
262	41/67(4689)	18/68(2750)	31/68(4790)	43/69(6780)

c. For most pages enough columns are normally provided for entries between successive Changes.

d. A few volumes of Sailing Directions contain "a" pages (i.e. 152a). For such pages record the Notice to Mariners paragraph number with the preceding page number (i.e. 152). When correcting the text, however, read and correct the "a" pages.

e. Prior to use of this publication, inspect the Table of Contents, text, and indices for the area of operations and carefully note those pages which might be used. Such pages should then be appropriately corrected or annotated for all information contained in the Notice to Mariners paragraphs recorded abreast specific page numbers in the record. As with charts, only those pages actually used or referenced need be corrected.

f. If more than one volume of Sailing Directions is maintained, the Record of Applicable Notice to Mariners pages may be removed from each volume and inserted, collectively, in a loose-leaf binder. The Notice to Mariners paragraphs may then be entered for all Sailing Directions without recourse to each individual volume.

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CHAPTER 1

GENERAL REMARKS—BUOYAGE—SIGNALS—PILOTAGE—REGULATIONS—CAUTIONS— OCEANOGRAPHY—CLIMATOLOGY—ICE— GENERAL NAVIGATION IN THE BALTIC SEA, THE GULF OF FINLAND, AND THE GULF OF BOTHNIA

GENERAL REMARKS

This volume covers the northern part of the Baltic Sea occupied by the Gulf of Bothnia and the Gulf of Finland and describes the contiguous coasts of U.S.S.R., Finland, and Sweden.

GULF OF BOTHNIA

1-1 The Gulf of Bothnia extends over 360 miles in a northerly direction from its southern entrance, Södra Kvarken, to the Swedish-Finnish frontier. The western shore of the gulf is formed by Sweden and the eastern shore by Finland. The entrance of the gulf is restricted by the Åland Islands. Norra Kvarken is the narrowest part of the gulf and divides it into two parts; the southern part is known as Bottenhavet to the Swedes and Selkämeri to the Finns and the northern part as Bottenviken to the Swedes and Perämeri to the Finns. The shores of the gulf are rocky but not high, seldom being over 50 feet in height, and in the entrance, at its head, and in Norra Kvarken there are numerous islands and dangers.

The depth rarely exceeds 100 fathoms. The greatest depth found in the gulf is in a depression, 34 miles long and about 12 miles wide within the 100-fathom curve, north-eastward of Härnösand; the greatest depth being 161 fathoms, mud.

When ice forms over the shallow grounds adjoining the shores, large stones are lifted and transported considerable distances.

These, when accumulated, sometimes form formidable dangers to navigation, the more so as they are quite unknown to navigators until discovered by accident. This is especially true in the various inner channels which lead between the islets and rocks fronting the shores in many parts.

Details on density, salinity, surface temperature, and currents are given under the subject "Oceanography", beginning with section 1-35.

GULF OF FINLAND

1-2 The Gulf of Finland extends about 210 miles eastward from its entrance between Pöösapää Neem, on the Estonian coast, and Hangöudd, on the Finnish coast, to the port of Leningrad, at the head of Nevskaya Guba. The gulf is about 40 miles wide at its entrance, widens to about 65 miles in its eastern part, and thence narrows to about 10 to 15 miles near the approach to Nevskaya Guba.

The northern shore of the gulf proper is formed by Finland and the southern shore by Estonia. The Finnish coast is bordered by numerous islets, rocks, and dangers up to a distance of 16 miles offshore; the channels between these dangers are very narrow and intricate. The Estonian coast is less encumbered by off-lying features and is rather steep-to. There are a number of detached dangers in the center of the gulf, particularly in its eastern part.

Oceanographic details are given in sections 1-35 through 1-41.

RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC (R.S.F.S.R.)

1-3 The R.S.F.S.R. is the largest of the constituent republics of the Soviet Union. It occupies an area of 6,523,524 square miles, over 76% of the total area of the U.S.S.R., and stretches from the Gulf of Finland to the Pacific Ocean and from the Arctic Ocean to the Black and Caspian Seas. Moscow is the largest city and the capital.

The physical features of this vast republic are very varied and range from the tundra in the north to the rich agricultural area in the subtropical south and the steppes in the east. It contains great mineral deposits and about nine-tenths of the forest area of the U.S.S.R. Its coast line is approximately 26,500 miles long.

GOVERNMENT.—The U.S.S.R. is a socialist state, the political units of which are the soviets or councils of workers. A central and local authority is vested in these soviets. It consists of a federation of 15 republics within certain of which are further subdivisions; the R.S.F.S.R. is one of the constituent republics.

The legislative power is vested in the Supreme Soviet of the U.S.S.R., which consists of two chambers, the Soviet of the Union and the Soviet of Nationalities. The executive and administrative power is vested in the Council of Ministers, which is appointed and is responsible to the Supreme Soviet.

The Presidium of the Supreme Soviet of the U. S. S. R., elected by both chambers of the Supreme Soviet, acts as the supreme authority between sessions of the Supreme Soviet.

Each of the constituent republics retains its own Supreme Soviet and Council of Ministers.

Population.—In 1960, the estimated population of the R.S.F.S.R. was 119,000,000.

PORTS.—The principal R.S.F.S.R. ports described within this volume are Leningrad and Kronshtadt.

Industries and products.—About 70% of the total industrial and agricultural output of the U. S. S. R. is produced in R. S. F. S. R. Besides agriculture, mining, forestry, and

fishing there are large metallurgical, machinery, tools, vehicle, shipbuilding, chemical, food, building materials, and ferrous alloys industries. The principal exports are timber, grain, flax, petroleum, and fish. The chief imports are machinery, tools, railroad vehicles, iron and steel.

Communications.—There is steamer communication with foreign ports. There are about 68,000 miles of navigable rivers. The Volga-Don Shipping Canal links the White, Baltic, Caspian, Azov, and Black Seas into a single water transport system.

The U. S. S. R. has an extensive railroad system, amounting to about 75,000 miles. There is domestic and international air service and a general telegraph and telephone system. Cables run from Leningrad to Denmark and from Vladivostok to Japan, China, and Hong Kong; the two ports are connected by land lines.

Holidays.—The following holidays are observed in the U. S. S. R.: All Sundays; January 1, 9 (Remembrance Day), and 22 (Lenin's Death); May 1 and 2; November 7 and 8 (Anniversary of the October Revolution); and December 5.

Standard time.—The standard time of the western part of the R. S. F. S. R. is of the meridian of 30° E., or two hours fast of Greenwich civil time.

Currency, weights, and measures.—The monetary unit of the U.S.S.R. is the ruble. There are 100 kopecks in the ruble.

The metric system of weights and measures is used.

ESTONIA

1-4 Estonia lies between the Gulf of Finland, on the north, the Russian Socialist Federal Soviet Republic, on the east, Latvia and the Gulf of Riga, on the south, and the Baltic Sea, on the west. Including the several large islands off the northwestern coast, the country comprises 17,413 square miles. Tallinn is the capital.

Estonia, as well as Latvia and Lithuania have been incorporated into the Soviet Union. The United States has not recognized this act.

In general the country is low. About two-thirds of the land is cultivated, about one-fifth consists of forests, and the remainder is untilled but includes an extensive peat bog. Moraines cover the surface and are thickest in the south and southeast. The forests are mainly in the northeast and southwest, and rich deposits of high quality shale are found on the north coast.

Government.—Estonia was an independent Baltic republic from 1918 to 1940, when it was annexed by the Union of Socialist Soviet Republics (U. S. S. R.).

Population.—In 1966 the population of Estonia was 1,285,000.

Ports.—Tallinn, Paldiski, and Narva-Jõesuu are the principal ports on the Gulf of Finland.

Industries and products.—Agriculture and dairy farming are the chief occupations. The textile, shipbuilding, and railroad repair industries are important. The chief crops are rye, oats, and barley. From her deposits of shale, gas and oil are being produced. The country also has valuable peat deposits.

Communications.—There is steamer communication with other Baltic ports. A railroad runs from Tallinn to Leningrad; the other principal towns are connected with the capital by railroad. The coastal towns are connected to the general telegraph system. There is regular air service to Leningrad and Moscow.

Standard time.—The standard time is of the meridian of 30° E., or two hours fast of Greenwich civil time.

Weights and measures.—The metric system of weights and measures is used.

FINLAND

1-5 Finland lies between the U.S.S.R. on the east, Norway, on the north, Sweden and the Gulf of Bothnia, on the west, and the

Gulf of Finland, on the south. The country, including the off-lying islands, consists of 10 departments and comprises an area of 130,116 square miles. Helsinki is the chief city and capital.

With the exception of the extreme north, the greater part of Finland is low and hilly with elevations of 400 to 600 feet. It is a land of forests, swamps, and lakes; nearly 10% of the total area consists of lakes, most of which lie in the southern half of the country and provide important waterways. Very little land is under cultivation. The principal agricultural areas are in the coastal belt, which in the south and southwest is uneven and hilly and in the west is drained by numerous rivers.

The country has a coast of about 684 miles.

Government.—Finland is an independent republic. The executive power is vested in the President, who is assisted by a Cabinet of Ministers with a Prime Minister. The legislative power is vested in a single-chambered parliament of 200 members elected by direct vote.

POPULATION.—Finland, one of the most sparsely populated countries in Europe, has an estimated population of about 4,650,000 (1967). The southern coastal area is the most densely populated part of the country. Finnish and Swedish are official languages.

PORTS.—The principal ports are Helsinki, Turku, Kotka, Pori, Hamina, Hangoo (Hanko) Oulu, Rauma, Kemi, and Vaasa. There are numerous other ports of lesser importance.

Industries and products.—Finland is basically an agricultural and wood-producing country. The principal crops are cereals, potatoes, and sugar beets. The forest products are of primary importance to the economy of Finland as the leading industries are engaged in the production of lumber, pulp, and paper. Fishing is an important industry. The

principal exports are paper industry products, wood industry products, copper and copper products, electric pig iron, ceramics, glassware, and granite. The chief imports are machinery, textile raw materials, coal and petroleum, vehicles, farm machinery, and fertilizers.

Communications.—There is regular steamer communication with continental and other foreign ports. The southern half of the country is well served by highways, railroads, and lake steamers. Air lines provide domestic and international service. All towns and centers of population are connected to the general telephone and telegraph systems. There is cable and radio communication with foreign lands.

Holidays.—The following are observed as general holidays: New Years Day; Epiphany; Good Friday; Easter Monday; Worker's Holiday (May 1); Ascension Day; Whit Monday; Midsummer Day (June 24); All Saints' Day; Independence Day (December 6); Christmas Day; and Boxing Day.

Standard time.—The standard time is of the meridian of 30°E., or two hours fast of Greenwich civil time.

Currency, weights, and measures.—The monetary unit is the markka of 100 pennis. Paper currency consists of notes of 10,000, 5000, 1000, 500 and 100 markka. Silver coins are 100, 200, and 500 markkas. Aluminum-bronze coins are 10, 20 and 50 markkas; iron coins 1 and 5 markkas.

The metric system of weights and measures is used.

SWEDEN

1-6 Sweden, comprising an area of 173,423 square miles, occupies the eastern and larger part of the Scandinavian Peninsula and has an extreme length of 978 miles and extreme width of 310 miles. It is separated from Norway by a mountain range, from Finland by the Gulf of Bothnia and the rivers Konkamaalv, Muonialv, and Tornealven, and from Denmark by Oresund. Of the estimated boundary of 6,100 miles, about 4,737 miles are coastal.

The three main territorial divisions are Norrland, in the north, Svealand, the central part, and Götaland, the southern area. The four main physical regions are: the northern mountains and lake region, which covers Norrland and the western part of Svealand; the fertile lowlands of central Sweden which resemble the coastal plains; the Småland highlands in the south and southeast; and the plain of Skåne, which occupies the extreme southern part of the peninsula.

About 8 percent of the country area consists of lakes. Of European countries, only Finland exceeds Sweden in the number of its lakes. The large lakes Vänern, Vättern, and Mälaren are connected with the ports of Stockholm and Göteborg by navigable rivers and canals.

In the northern part of the country there are numerous rivers which run through forests and enter the sea through long estuaries. In the southern part of the country there are few rivers.

Stockholm is the capital and the largest city.

Government.—The Kingdom of Sweden is a constitutional monarchy. The executive power is in the hands of the King who acts with the advice of the Council of State, the head of which is the Prime Minister. The King also shares legislative powers with the Parliament. The parliament is formed by two chambers, the Upper Chamber being elected by indirect vote and the Lower Chamber by direct vote. The country is divided into 25 administrative districts or lan, the city of Stockholm forming one of these.

Population.—The population was estimated in 1965 to be 7,772,500, being denser in the southern provinces. The Swedes belong to the Scandinavian race, but there are a number of Lapps in the north and numerous Finns. The official language is Swedish; English and German are widely understood.

Ports.—The principal ports within the scope of this volume are Gävle, Söderhamn, Hudiksvall, Sundsvall, Härnösand, Örnsköldsvik, Umeå, Skelleftehamn, Piteå, and Luleå.

In addition there are numerous loading places in the vicinity of the above ports and in the numerous rivers.

Industries and products.—Sweden is an agricultural nation, the principal large-scale agricultural enterprises being confined to southern and central Sweden. Mining is the leading industry; it is devoted mainly to the extraction of iron ores, although gold, silver, lead, copper, zinc, pyrites, tungsten, manganese, molybdenum, arsenic, antimony, and nickel are extracted from deposits in the north. The forest products industry is extensive. Other industries are the manufacture of textiles, fishing, shipbuilding, metallurgy, and machinery production. The principal exports are wood pulp, wood products, paper, iron ore, and iron and steel. The imports consist largely of raw materials and fuel for agriculture and other industries.

Communications.—Sweden has all the modern means of communication. Its extensive railroad system has direct connection with Norway and Finland and with the continent by means of ferry steamers. The country has steamer, air, radio, cable, telegraph, and telephone communication with all parts of the world; the domestic service is equally good.

Holidays.—The general holidays observed are as follows: January 1 and 6; Annunciation; Good Friday; Easter Monday; May 1; Ascension Day; Whit Monday; Midsummer Day; and December 25 and 26.

Standard time.—The standard time is of the meridian of 15° E., or one hour fast of Greenwich civil time.

Currency, weights, and measures.—The monetary unit is the krona of 100 ore. National bank notes for 5, 10, 50, 100, 1,000, and 10,000 kronor are legal tender.

The metric system of weights and measures is used.

DERATTING

1-7 Deratting can be carried out and Deratting Exemption Certificates can be issued to vessels at Tallinn, Leningrad, Hanko, Helsinki, Kota, Turku, Rauma, Pori, Vaasa, Hamina, Harnosand Gavle, Hudiksvall, Sundsvall, Ornskoldsvik, Umea, Pitea and Lulea.

DRYDOCKS AND MARINE RAILWAYS

1-8 **Estonia.**—Tallinn has floating drydocks and a marine railway. There is a small marine railway at Loksa.

R. S. F. S. R. (Russia).—Kronshtadt has four drydocks. Leningrad has several floating drydocks and one marine railway. There is a marine railway at Vyborg.

Finland.—Helsinki has drydocks, floating drydocks and marine railways. Turku has a drydock, a floating drydock and a marine railway. Rauma has a drydock. There are small marine railways at Oulu and Vaasa.

Sweden.—Gustavsvik has a drydock. There are small marine railways at Öregrund and Sundsvall.

ABNORMAL MAGNETIC DISTURBANCES

1-9 Abnormal magnetic disturbances are reported to exist in various parts of the Gulf of Finland and Gulf of Bothnia. They are shown on the following isogonic chartlets and are described with the related areas.

LIFESAVING STATIONS

1-10 The lifesaving stations listed below are located within the limits of this volume, and the equipment available at each is indicated as follows: A, lifeboat; B, shore station; C, motor lifeboat; D, rescue vessel; E, combined pilot vessel and rescue vessel.

Estonia, north coast:

Paldiski - - - - -	A.	Ramo Island - - - - -	C.
Tallin - - - - -	A.	Juminda Point - - - - -	A.
Pirita - - - - -	A.	Perespe - - - - -	A.
Wrangel Island - - - - -	C.	Letipea Neem - - - - -	A.

U.S.S.R., Leningrad Guba:

Lomonosov - - - - -	A.	Lisly Nos - - - - -	A.
Petrodvorets - - - - -	A.	Sestoret'sk - - - - -	A.
Strel'na - - - - -	A.		

Finland, south coast:

Hanko - - - - -	D.	Haikko - - - - -	B.
Hög Bågaskär - - - - -	C.	Pellinge - - - - -	A.
Porkkala - - - - -	B.	Orregrund - - - - -	B.
Helsinki - - - - -	D.	Kotka - - - - -	D.
Harmaja - - - - -	B.	Haapasaari - - - - -	A.
Söderskar - - - - -	B.		

Finland, Åland Islands:

Sigul'skär - - - - -	B.	Kökar - - - - -	B.
Eckerö - - - - -	C.	Utö - - - - -	C.

Finland, west coast:

Uusikaupunki - - - - -	D.	Norrskär - - - - -	B.
Rauma - - - - -	B.	Valassaaret - - - - -	C.
Säppi - - - - -	B.	Tankar - - - - -	A.
Reposaari - - - - -	C.	Iso Kraaseli - - - - -	B.
Sälgrund - - - - -	C.	Kellon Kiviniemi - - - - -	C.
Rönnskär - - - - -	B.		

Sweden, east coast:

Malören - - - - -	B.E.	Stocka Hamn - - - - -	D.
Rödskallen - - - - -	E.	Hudviksvall - - - - -	B.E.
Rönnskär - - - - -	B.E.	Söderhamn - - - - -	B.
Bjuröklubb - - - - -	B.E.	Lilljunafun - - - - -	E.
Umeå - - - - -	B.	Gävle - - - - -	B.E.
Holmö - - - - -	D.	Örskär - - - - -	D.
Örnsköldsvik - - - - -	B.	Singö - - - - -	D.
Härnösand - - - - -	B.E.	Svartklubben - - - - -	B.
Sundsvall - - - - -	B.E.	Arholma - - - - -	B.E.

Note.—Swedish lifesaving stations can be contacted by telephone, by radio through the coast radio stations, or by the call signal SJÖRÄDDNING (Sea Rescue).

An air-rescue is maintained by Sweden to search for and relieve vessels or aircraft missing or in distress.

Swedish rescue vessels, including the ones at Holmö, Stocka and Örskär, are provided with radar and can, on request through the coastal radio stations, during fog and snow, give assistance in determining locations.

The Swedish Life Boat Institution urgently requests all masters of vessels trading off the Swedish coast to contact Swedish coastal radio stations in ample time of difficulties encountered by their vessels which may ultimately result in shipwrecks or disaster.

Vessels should keep the coastal radio station well informed during critical situations.

Finnish rescue craft equipped with radar can be contacted through coastal radio stations located at Jollas (Helsinki), Kotka, Turku, Maarianhamina, Vaasa and Kuusiluoto (Röyttä).

BUOYAGE**U. S. S. R.**

1-11 General remarks.—In 1947 the U. S. S. R. adopted a new uniform system of buoyage based on those of various other countries and on the proposals of the International Hydrographic Bureau. Navigators are advised that both old and new systems may be found in the waters of the U. S. S. R. until the change-over is completed.

The cardinal system is used to mark off-lying dangers and those extending from the coast, spoil grounds, prohibited areas and exercise grounds, and fishing grounds.

The lateral system is used in artificial channels and natural fairways.

Miscellaneous buoys are used to indicate wrecks and obstructions, quarantine grounds and quarantine anchorages, submarine cables, and measured distances.

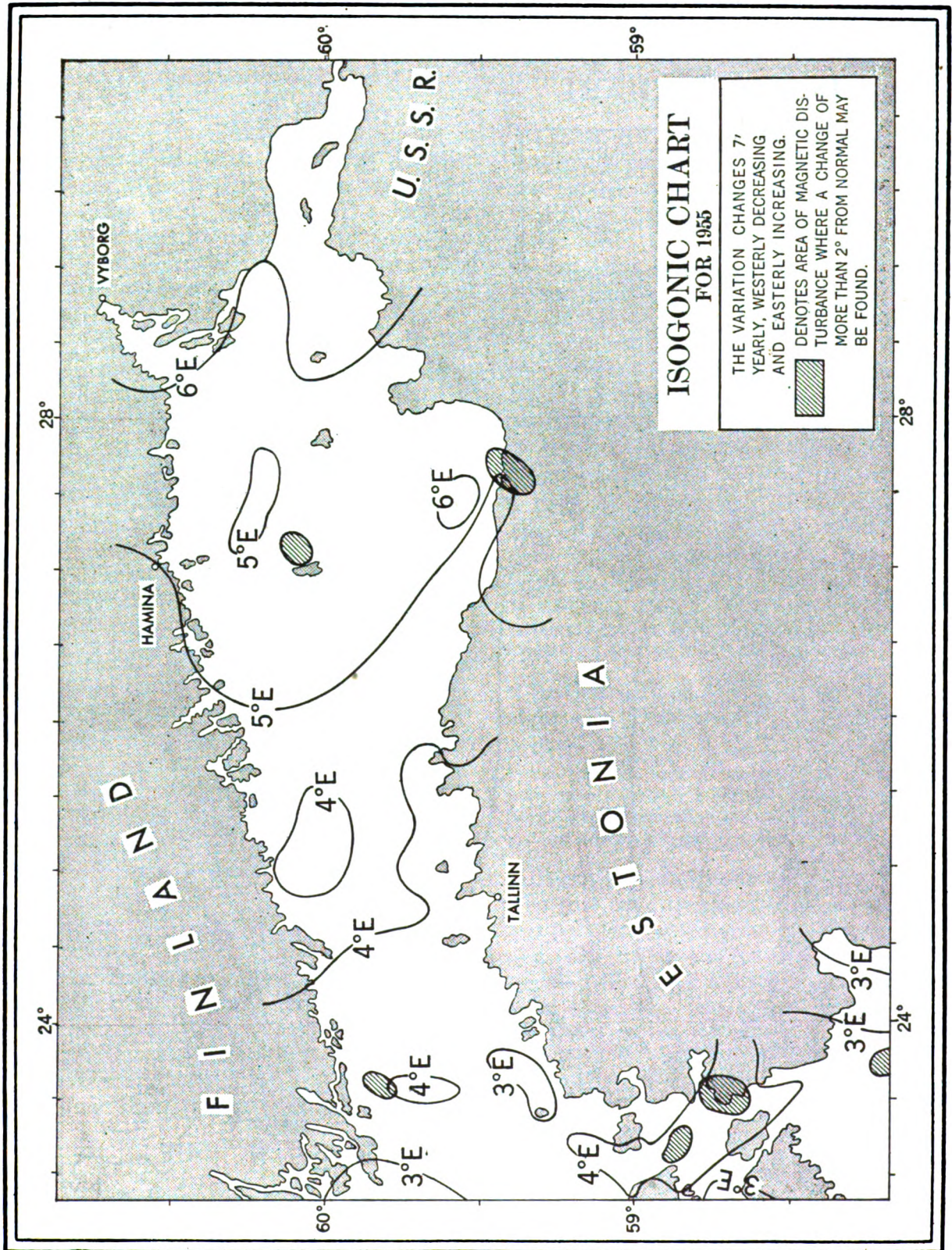
The names, coloring, light characteristics, and shape of top marks of the various aids are uniform, but the shapes and forms of construction of the buoys may differ.

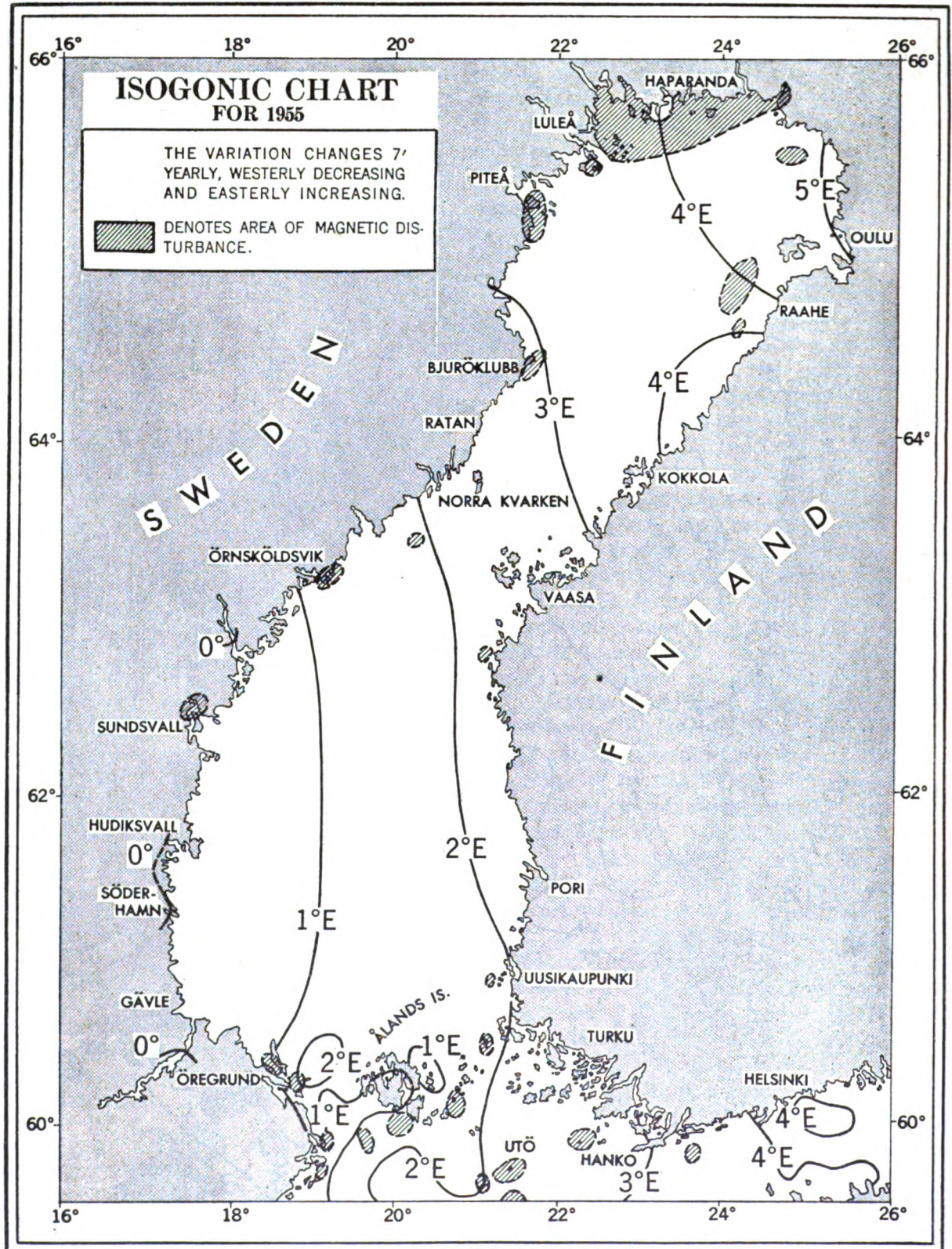
Lighted and unlighted buoys may be fitted with bells, whistles, etc. Brooms and besoms may be used instead of cones as top marks.

Figures 1 and 2 present graphically the buoyage system of the U. S. S. R.

Cardinal system.—The cardinal system marking natural dangers uses spar buoys and unlighted and lighted buoys as follows:

North Buoy marks the southern side of the danger and is left to the north when passing. The spar buoy is a red pole with





a red conical top mark, point down. The buoy is painted red. The light buoy is red, has a red superstructure with a lantern on top of it, and shows a flashing red light every 5 seconds.

South Buoy marks the northern side of the danger and is left to the south when passing. The spar buoy is a white pole with black conical top mark, point up. The buoy is painted white. The light buoy is white, has a white superstructure with a lantern on top of it, and shows a flashing white light every 5 seconds.

East Buoy marks the western side of the danger and is left to the east when passing. The spar buoy is a black and white pole with two conical top marks, bases together. The buoy is painted in black and white vertical stripes. The light buoy is painted in black and white vertical stripes, has a superstructure, the upper part black and lower part white, with a lantern on top of it, and shows a flashing white light every $2\frac{1}{2}$ seconds or a group flashing white light (2 flashes) every 5 seconds.

West Buoy marks the eastern side of the danger and is left to the west when passing. The spar buoy is a white and red pole with two conical top marks, points together. The buoy is painted in red and white vertical stripes. The light buoy is painted in red and white vertical stripes, has a superstructure, the upper part white and lower part red, with a lantern on top of it, and shows a flashing red light every $2\frac{1}{2}$ seconds or a group flashing red light (2 flashes) every 5 seconds.

Cross Buoys mark small dangers and may be passed on all sides. The spar buoy is a pole with red and white bands with a white cross top mark over a red ball. The buoy is red with a white horizontal band in the middle and four white vertical stripes from the top

to the water line, forming four white crosses. The light buoy is red, has a superstructure painted red, white, and red with a white cross on a red background in the middle part, and shows a flashing green light.

Lateral system.—The lateral system marks artificial channels and natural fairways with spar buoys, buoys, and buoys with superstructures (lighted and unlighted). The starboard hand (right side) of the channel, entering from seaward, has black markers, white lights, and odd numbers. The port hand (left side) of the channel has red markers, red lights, and even numbers. Turning buoys, bifurcational and conjunctive buoys, and midchannel buoys are also used. Midchannel dangers are marked by cross buoys or buoys similar to those of the cardinal system.

Port Hand Buoys are moored on the left side of the channel. The spar buoy is a red pole with a black conical top mark, point down. The conical buoy is red. The light buoy is red with a white even number, has a red superstructure with lantern on top of it, and shows a flashing red light.

Starboard Hand Buoys are moored on the right side of the channel. The spar buoy is a black pole with a black conical top mark, point up. The conical buoy is black. The light buoy is black with a white odd number, has a black superstructure with a lantern on top of it, and shows a flashing white light.

Turning Buoys mark a bend in the channel. The *port hand turning buoy* is to be left on the port hand when entering. The spar buoy is a pole, the top and lower part red and the middle white, with a black conical top mark, point down. The conical buoy is red with a white horizontal stripe in the middle. The light buoy is red with a white horizontal band in the middle and an even number painted in red on it, has a superstructure, the top and

lower part red and the middle white, and shows a flashing red light.

The *starboard hand turning buoy* is to be left on the starboard hand when entering. The spar buoy is a pole, the top and lower part black and the middle white, with a black conical top mark, point up. The conical buoy is black with a white horizontal band in the middle. The light buoy is black with a white horizontal band in the middle and an odd number painted in black on it, has a superstructure, the top and lower part black and the middle white, and shows a flashing white light.

Midchannel Buoys are located on the center line of the fairway or recommended course and may be passed on either side. The spar buoy is painted in black and white bands and has a black ball top mark. The conical buoy is painted in white and black horizontal bands. The light buoy is painted in black and white horizontal bands, has a white superstructure with a lantern on top of it, and shows a flashing white light.

Midchannel Turning Buoys are located at the turning positions of the fairways. The spar buoy is painted in red and white bands and has a red ball top mark. The conical buoy is painted in white and red horizontal bands. The light buoy is painted in red and white horizontal bands, has a white superstructure with a lantern on top of it, and shows a flashing red light.

The midchannel buoys and midchannel turning buoys are used in special cases. When spar buoys substitute any lighted or unlighted buoys (with superstructure) they carry two balls near the top in place of one, painted the same regulation colors.

1-12 Bifurcational and Conjunctional Buoys mark the division of one channel or the junction of two channels and may be passed on either side.

The spar buoy is painted in black and red horizontal bands with a ball top mark, the upper half black and lower half red. The conical buoy is painted in red and black vertical stripes, four of each color. The light buoy is painted the same as the ordinary buoy, has a superstructure, the upper and lower parts red and the middle black, with a lantern on top of it, and shows a flashing white light.

Detached dangers in a channel are marked by cross buoys, as described in the cardinal system; these buoys, of lighted, show a flashing green light.

Wreck Buoys are moored close to the wreck they mark, and the actual position with reference to the wreck is published in U. S. S. R. Notices to Mariners. Green spar buoys, with a green ball top mark, green buoys, and green light buoys, with a green superstructure and showing a flashing green light, are used.

Spoil Grounds are marked in the cardinal system by spar buoys, each buoy having a black cross bar below the flag, as follows:

North Spar Buoy marks the southern side of the spoil ground and is to be left to the north. The spar is painted red and the flag is triangular, the upper part white and lower part red.

South Spar Buoy marks the northern side of the spoil ground and is to be left to the south. The spar is painted white and the flag is triangular, the upper part white and lower part black.

East Spar Buoy marks the western side of the spoil ground and is to be left to the east. The upper part of the spar is black and lower part white. The flag is square, white over black diagonally.

U.S.S.R. BUOYAGE SYSTEM

Cardinal System
Marking Natural Navigational Dangers

Lateral System
Marking Artificial Channels And Natural Fairways

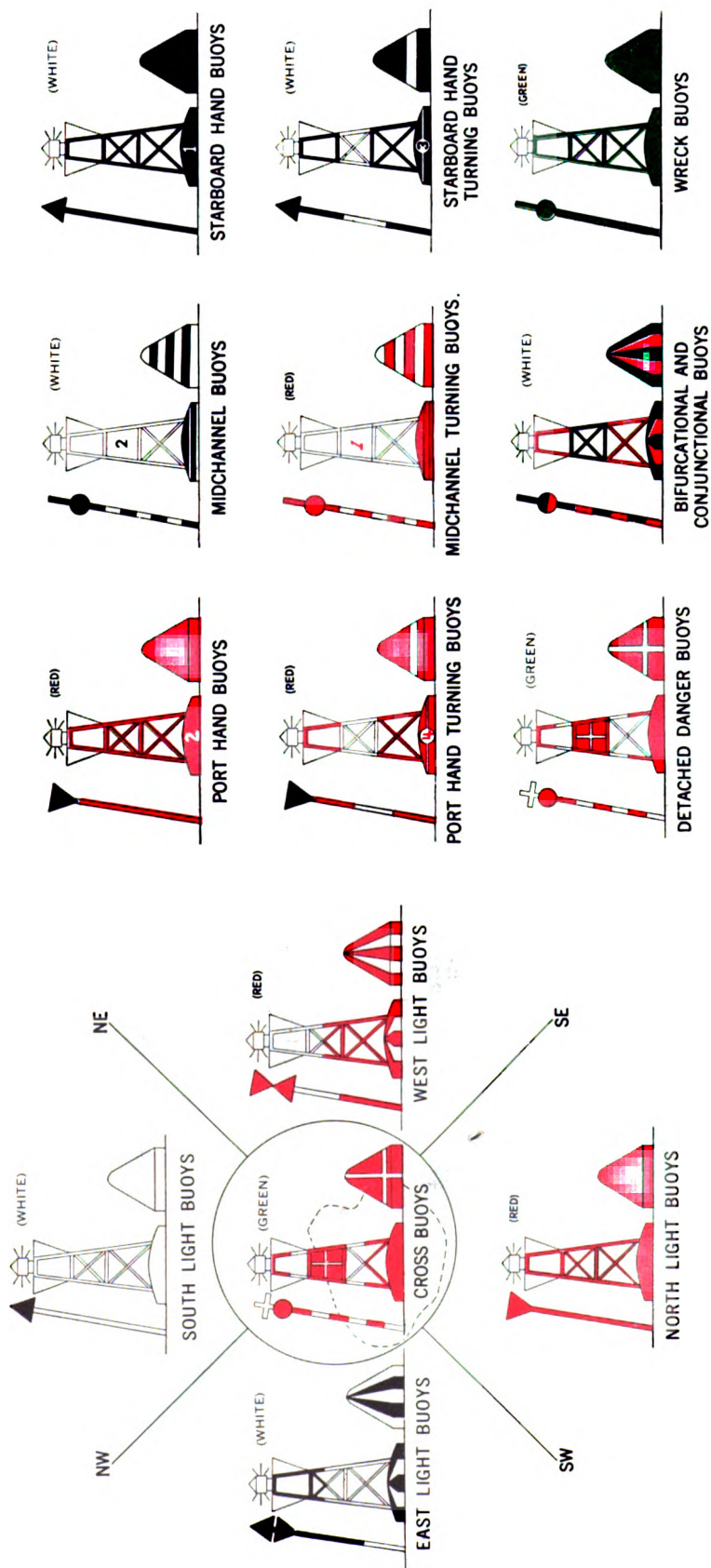


Figure 1

U.S.S.R. BUOYAGE SYSTEM

Miscellaneous Buys

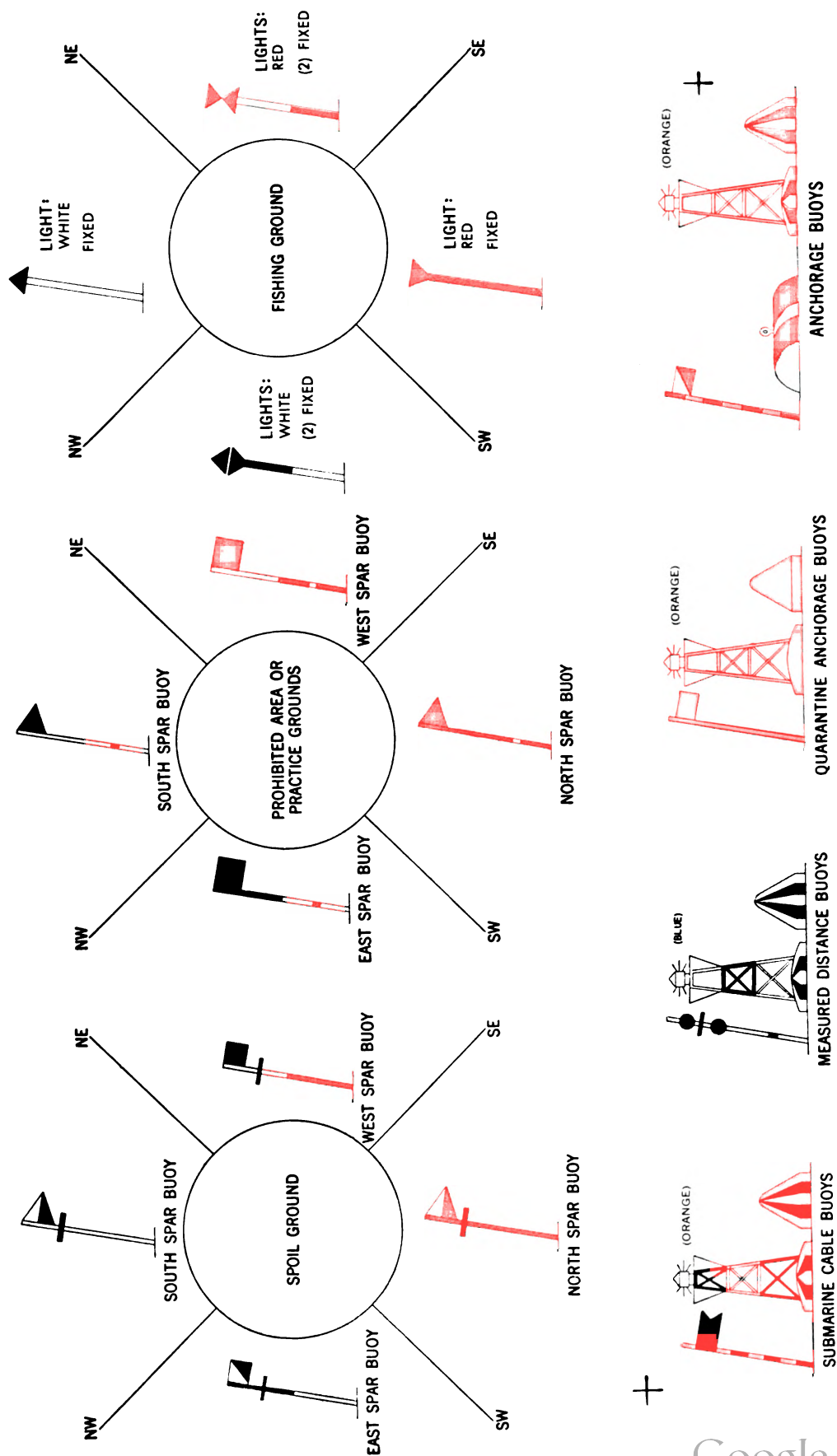


Figure 2

West Spar Buoy marks the eastern side of the spoil ground and is to be left to the west. The upper part of the spar is white and lower part red. The flag is square and black.

PROHIBITED AREAS, GUN PRACTICE AREAS, AND EXERCISE GROUNDS are marked in the cardinal system by spar buoys with flags. In the event a prohibited area is marked by lighted or unlighted buoys, such buoys will conform to the rules for marking natural dangers, but in every case the appropriate spar buoy will be moored alongside.

North Spar Buoy marks the southern side of the area and is to be left to the north. The spar is red with a small white band and the flag is triangular and red.

South Spar Buoy marks the northern side of the area and is to be left to the south. The spar is white with a small red band and the flag is triangular and black.

East Spar Buoy marks the western side of the area and is to be left to the east. The spar is black in its upper part and white in its lower part with a small red band in the white part. The flag is square and black.

West Spar Buoy marks the eastern side of the area and is to be left to the west. The spar is white in its upper part and red in its lower part with a small white band in the red part. The flag is square and red.

FISHING GROUNDS are marked by spar buoys with flags in the cardinal system as follows:

North Spar Buoy marks the southern side of the fishing ground and is to be left to the north. The spar is red and has a triangular flag blue over red.

South Spar Buoy marks the northern side of the fishing ground and is to be left to the south. The spar is white and has a triangular flag white over blue.

East Spar Buoy marks the western side of the fishing ground and is to be left to the east. The spar is black in its upper part and white in its lower part; the flag is square white over blue diagonally.

West Spar Buoy marks the eastern side of the fishing ground and is to be left to the

west. The spar is white in its upper part and red in its lower part; the flag is square blue over red diagonally.

FISHING GROUNDS may also be marked by spar buoys in the cardinal system as follows:

North Spar Buoy painted red with one red cone, point down, showing one fixed red light.

South Spar Buoy painted white with one black cone, point up, showing one fixed white light.

East Spar Buoy with the top half painted black and the lower half white with two black cones, base to base, showing two white fixed lights.

West Spar Buoy with the top half painted white and the lower half red with two red cones, point to point, showing two fixed red lights.

SUBMARINE CABLES are marked by spar buoys and lighted and unlighted buoys. The spar buoy is painted in yellow and black bands and has a black burgee as a top mark. The buoy is painted in yellow and black vertical stripes. The light buoy is painted in yellow and black vertical stripes, has a superstructure, the upper and lower parts black and the middle yellow, with a lantern on top of it, and shows an occulting orange light.

QUARANTINE GROUNDS AND ANCHORAGES are marked by spar buoys and lighted and unlighted buoys.

Quarantine Grounds are marked by yellow spars with a yellow flag as top mark, by yellow buoys, and by light buoys painted yellow and showing a flashing orange light.

Quarantine Anchorages are marked by red and yellow banded spars with a square flag yellow over red diagonally, by buoys painted in red and yellow vertical stripes, and by light buoys painted in red and yellow vertical stripes and having a yellow superstructure; the light buoys show a flashing orange light. Mooring buoys, if tun-shaped, are painted red with a yellow band around the bilge. Can-shaped mooring buoys do not differ from ordinary mooring buoys.

MEASURED DISTANCES are marked at the intersections of the running and transverse transits by spar buoys and by lighted and unlighted buoys. The spar buoy is painted white with a small blue band and has a blue cross bar between two blue balls as a top

mark. The buoy is painted in white and blue vertical stripes. The light buoy is painted in white and blue vertical stripes, has a superstructure, the upper and lower parts white and the middle blue, with a lantern on top of it, and shows a flashing blue light.

FINLAND

1-13 GENERAL.—In the uniform system of buoyage in Finnish waters, spar buoys are used extensively in marking shoals and channels, although buoys, mostly light buoys or light and whistle or light and bell buoys, may be used during the ice-free season. The position of the buoys in respect to the fairway or shoals is indicated by color and top marks (See figure 3). The newly adapted system of buoyage became effective in Finnish territorial waters during the spring of 1965. Mariners are warned that both the old and new systems may be encountered during the transition period.

CHANNEL FAIRWAYS AND DANGERS are marked as follows:

A NORTH SPAR BUOY marks the northern side of the fairway and is moored southward of the danger. The buoy is red with a white band and has a red cone top mark, point down.

A SOUTH SPAR BUOY marks the southern side of the fairway and is moored northward of the danger. The buoy is white with a black band and has a black cone top mark, point up.

A WEST SPAR BUOY marks the western side of the fairway and is moored eastward of the danger. The buoy is white in its upper part, red in its lower part and has two red cone top marks, point to point.

An EAST SPAR BUOY marks the eastern side of the fairway and is moored westward of the danger. The buoy is black in its upper part, white in its lower part and has two black cone top marks, base to base.

DETACHED DANGERS that can be passed on either side are marked by a spar buoy,

painted in red and black bands, with a red cross bar near the top.

NOTE.—All spar buoys in addition to the top marks, may carry a ball beneath the top mark; the north and west buoys carry a red ball and the south and east buoys carry a black ball. Buoys marking detached dangers may carry, in addition to the cross bar, a red and black ball. Spar buoys without top marks may also be used.

WRECK MARKING.—Wrecks on the Finnish coast are marked according to the Swedish system as described in section 1-14.

SUBMARINE CABLES are marked at their landing places by a notice board with the word "Kaapeli" (cable) on it. The direction of the cable may be indicated by beacons according to the Swedish system as described in section 1-14.

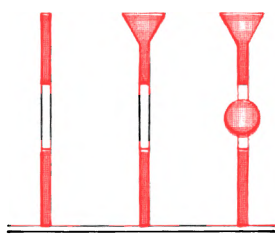
SURVEYING MARKS consist of large spars with cylindrical top marks, with or without a flag, or of smaller spars, or small buoys, which differ from and cannot be mistaken for navigational aids.

SWEDEN

1-14 In Swedish waters the navigational aids used to mark channels and the adjacent dangers and shoals in the open sea consist of spar buoys, lighted and unlighted buoys, and fixed seamarks such as towers, cairns, and perches. These aids not only indicate the related direction of the dangers they mark, but also serve to mark the side of the channel.

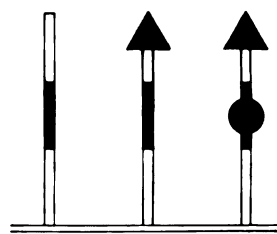
FAIRWAY MARKERS.—A combined cardinal and lateral system is used, the marking takes place with regard to the main direction of the fairways, which is either north-south or east-west. When passing along the same fairway the same sort of perches or buoys should always be kept on the same side regardless of occasional deviations of the fairways.

FINNISH BUOYAGE SYSTEM



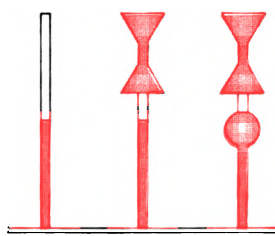
NORTH BUOY

Shoal lies on north side of buoy



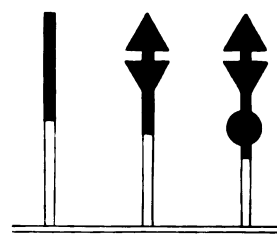
SOUTH BUOY

Shoal lies on south side of buoy



WEST BUOY

Shoal lies on west side of buoy



EAST BUOY

Shoal lies on east side of buoy



CROSS BUOY

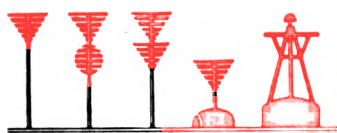
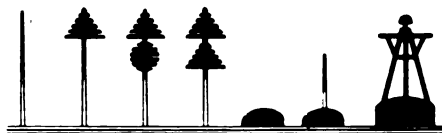
Small shoal — can be passed on all sides

Figure 3

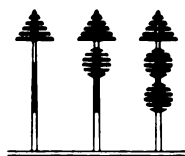
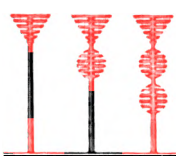
GENERAL REMARKS

SWEDISH BUOYAGE SYSTEM

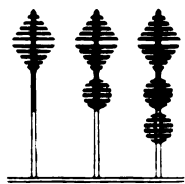
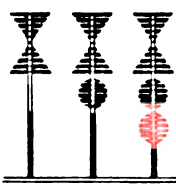
IN CHANNELS

Buoys and Beacons marking
N & W sidesBuoys and Beacons marking
S & E sidesBuoys and Beacons marking Shoal
which may be passed on either side

IN OPEN WATERS

Buoy marking
N & W sides
of ShoalBuoys and Beacons marking
N. side of Shoal

S. side of Shoal

Buoys and beacons marking
W. side of Shoal

E. side of Shoal

Buoy marking
S & E sides
of Shoal

Channel center line Buoys & Beacons

Figure 4

DIAGRAM OF SWEDISH BUOYAGE

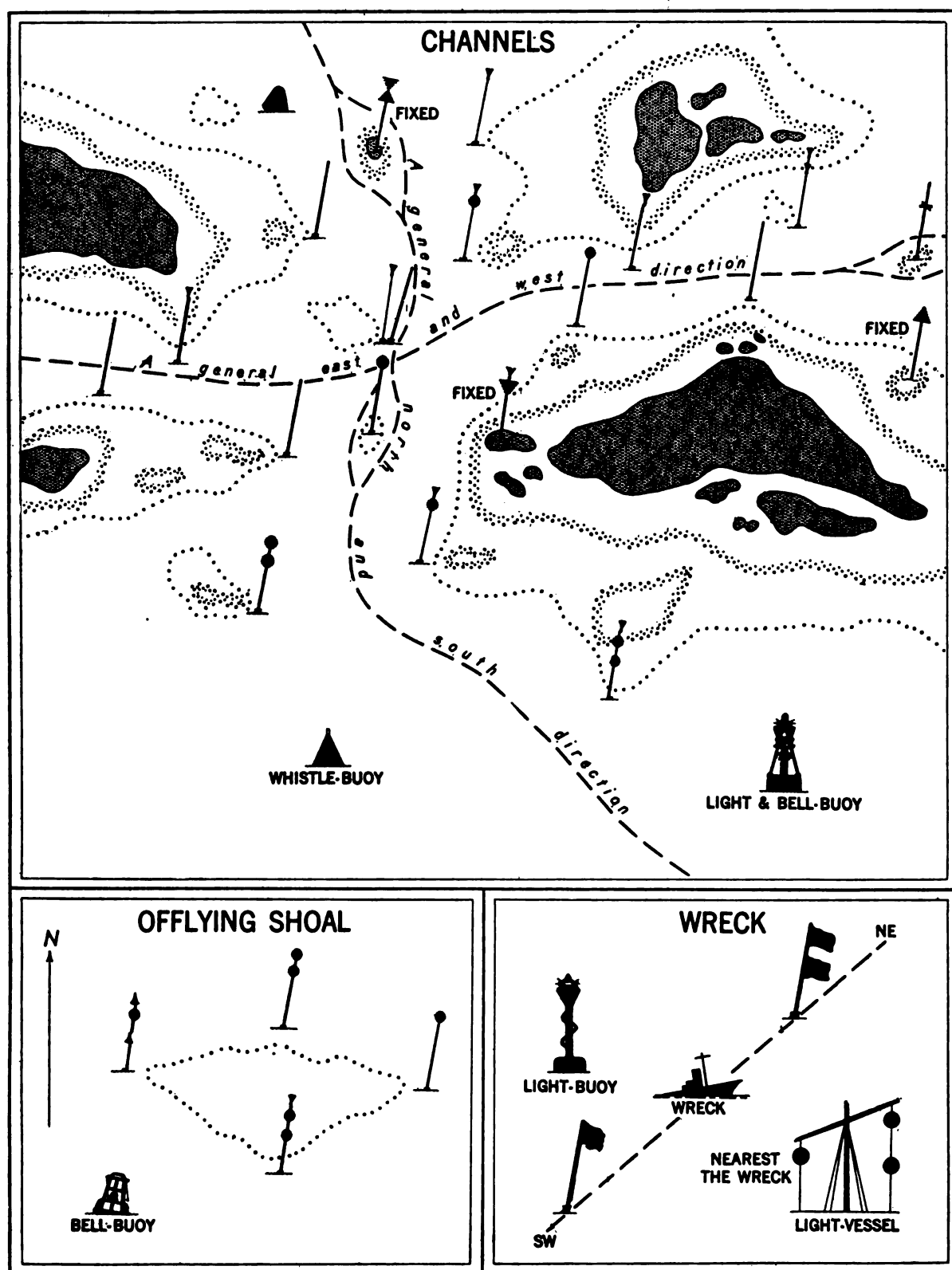


Figure 5

H. O. 148

ON THE NORTHERN AND WESTERN side of the fairway: Red perches with one or two red topmarks, consisting of cones, points down. When buoys are used, they are painted red.

ON THE SOUTHERN AND EASTERN side of the fairway: Black and white perches, either without topmarks or with one or two topmarks, consisting of cones, with points up. When buoys are used they are painted black.

MIDDLE GROUNDS that can be passed on either side are marked by black and red perches with one or two balls, perches and topmarks being painted in black and red, horizontal bands. When buoys are used they are painted in black and red, horizontal bands, or vertical stripes.

Perches with cone topmarks may also be furnished with a ball below the cone, the ball being painted with the same color as the cone topmark.

SHOALS IN THE OPEN SEA, outside the coastal reefs and marked fairways, are marked in accordance with a cardinal system, the shape and color of the perches depend on the bearing from the danger. The bearing is indicated to the nearest cardinal point.

NORTH FROM THE DANGER: White perches with a black band and a black cone topmark, point up.

WEST FROM THE DANGER: Black and white perches with two black cone topmarks, base to base.

SOUTH FROM THE DANGER: Red perches with one red cone topmark, point down.

EAST FROM THE DANGER: White and red perches with two red cone topmarks, point to point.

MIDDLE OF A FAIRWAY, for instance in a mine swept channel: Black and red perches with one or two ball topmarks, perches and topmarks being painted in black and red bands.

Perches with cone topmarks may also be furnished with one or two ball topmarks below the cones, the balls being painted with the same color as the cones.

BUOYS IN THE OPEN SEA:

North and west from the danger: Black buoys.

South and east from the danger: Red buoys.

In the middle of a channel: Black and red buoys, painted in horizontal bands or vertical stripes.

DIRECTIONS OF SWEDISH FAIRWAYS.—The general rule regarding the buoyage of channels (not including shoals or banks that extend in other directions than toward the fairway) is described above, but, as few channels maintain the same direction through their entire length, the assumed directions, for the purpose of buoyage, are given in table 1.

TABLE 1
DIRECTION OF SWEDISH FAIRWAYS

From—	To—	Direction
Singösund.....	Östhammar, Harg, and north entrance to Kålsösund.	East-west.
North entrance to Kålsösund.....	Hallsta and Skärsta.....	North-south.
Höggrund at Örsär—		
Svartklubben Channel.....	Singösund-Östhammar.....	North-south.
Sea at Örsär.....	Öregrund and Svartklubben.....	Do.
Sea.....	Kallrigafjärden.....	East-west.
Do.....	Ångskär.....	Do.
Do.....	Karlholm.....	North-south.
Do.....	Skutskär, Harnäs.....	Do.
Sea at Eggegrund.....	Gävle, north or south of Limö.....	East-west.
Sea at Trödjehällan.....	Bönan.....	North-south.
Sea.....	Norrsundet.....	East-west.
Sea at Gåsholma.....	Sunnäs.....	South-north.
Channel Gåsholma-Sunnäs.....	Axmarsbruk.....	East-west.
Sea at Gåsholma.....	Axmarsky.....	Do.
Sea.....	Maråker.....	Do.
Sea at Storjungfrun.....	Ljusne.....	Do.
Sea.....	Anchorage west of Enskär.....	South-north.
Sea, south of Hällgrund.....	Stugsund.....	East-west.
Sea.....	Långvind.....	Do.
Sea, through Kråksundet.....	Hudiksvall and others.....	South-north.
Sea at Agö.....	Iggesund.....	East-west.
Do.....	Hudiksvall and others.....	South-north.
Do.....	Stockvik.....	East-west.
Do.....	Gnarp.....	Do.
Do.....	Galtström.....	South-north.
Do.....	Juniskärenshamn.....	East-west.
Söråker.....	Vivstararv, N. of Alnö.....	Do.
Sea at Brämö.....	Sundsvall, Vivstararv, and others.....	South-north.
Sea at Åstholmen.....	Söråker.....	Do.
Söråker.....	Vivstararv.....	East-west.
Sea at Härnö.....	Härnösand.....	Do.
Härnösand.....	Nyland and others.....	South-north.
Sea at Lungö.....	Channel Härnösand-Nyland.....	East-west.
Sea at Storön.....	Nora Fjärd.....	Do.
Sea at Ulvö.....	Ulvöhamn, western channel.....	West-east.
Do.....	Ulvöhamn, eastern channel.....	East-west.
Channel Råskär-Högbonden.....	Näske and Hummelvik.....	South-north.
Råskärsö (then west of Ulvö).....	Högbonden.....	North-south.
Sea at Skag.....	Örnsköldsvik.....	East-west.
Do.....	Skagshamn.....	South-north.
Do.....	Husum, Fanbyriken, and Gideåbacko.....	Do.
Sea at Järnäs.....	Nordmaling and others.....	South-north.
Do.....	Järnäshamn.....	Do.
Do (through Kalmarsund).....	Hamnskär (Hörnefors).....	Do.
Sea at Vapplan.....	Hamnskär.....	East-west.
Sea at Bredskär.....	Umeå and Holmsund.....	South-north.
Sea at Haddingarna.....	Bredskär.....	East-west.
Do.....	Bjuren.....	South-north.
Do.....	Ratan, south channel.....	Do.
Do.....	Ratan, north channel.....	North-south.
Do.....	Dalkarlså.....	South-north.
Do.....	Sikeå.....	East-west.
Do.....	Gumboda.....	South-north.
Do.....	Kräkånger.....	Do.
Do.....	Kallviken.....	Do.
Do.....	Bjuröklubb.....	East-west.
Do.....	Bureå.....	Do.
Do.....	Ursviken and Sävenäs.....	Do.
Do.....	Storkåge and Frostkåge.....	Do.
Sea at Romelsö (Hamnskär).....	Furuögrund.....	Do.
Do.....	Båtviken.....	South-north.

TABLE 1 (continued)

From—	To—	Direction
Sea south of Rönnkärr.....	Åby.....	Do.
Sea at Rönnkärr.....	Kinnbäcksfjärd.....	East-west.
Do.....	Piteå and others.....	South-north.
Channel Rödkallen— Tjuvholmsund.....	Channel Bondökallarna—Piteå.....	North-south.
Sea at Bondökallarna.....	Piteå and others.....	South-north.
Sea at Stor Rebben.....	Harrbäck.....	Do.
Channel Esparna-Luleå.....	Channel Rödkallen—Tjuvholmsund between Skorvgrunden.....	East-west.
Sea at Rödkallen.....	Luleå, through Tjuvholmsund.....	South-north.
Sea at Esparna or Rödkallen.....	Luleå and others, past Liggakär.....	Do.
Channel Liggakär-Töre.....	Channel Liggakär-Råneå, N. of Tisteröarna.....	East-west.
Channel Malören-Kalix.....	Channel Liggakär-Töre, S. of Hastaakär.....	Do.
Liggakär.....	Råneå, Jämtöund, and Strömsund.....	South-north.
Do.....	Töre and Siknäs.....	Do.
Channel Malören-Salmis.....	Channel Malören-Kalix, N. of Seskarö and Halsö.....	East-west.
Sea at Malören.....	Töre and Siknäs.....	South-north.
Do.....	Kalix, Karlsborg, and Nyborg.....	Do.
Do.....	Sandörsund and Båtakärnäs.....	Do.
Do.....	Salmis, Tervakari, and Pahaluoeto.....	Do.
Channel N. of Seskarö.....	Granvikshamn.....	North-south.

Light buoys marking wrecks are green and show a group flashing (2 flashes) green light when moored in a direction between north and east of the wreck and a flashing green light when moored in a direction between south and west of the wreck.

Wreck buoys are painted green and carry one green flag when moored in a direction between south and west of the wreck and two flags when moored in a direction between north and east of a wreck.

Wreck marks are always placed in the north-east or south-west quadrants from the wreck and between the wreck and the traffic routes. In open waters they are placed as nearly as possible northeast or southwest from the wreck. In narrow waters they are placed as nearly as possible on a line from the wreck at right angles to the channel, so

that it may be necessary to place the marking on either side of the quadrant.

Quarantine anchorages are marked by yellow mooring buoys.

Submarine cables are marked only by beacons or notice boards. If buoys are used they are painted red and white with the word "Kabel" in black in two places. Beacons and boards marking power cables carry the warning "Kabel" and "Ankring forbuden". In some counties the power cables are marked by white triangular boards with red edges.

In channels and frequented waters the line of the cable is indicated by two beacons or poles in range. The front beacon or pole has a red circle with white edges as a top mark and the rear beacon has the same circular top mark with a white diamond with red edges beneath it. In range these marks appear

as a white diamond between two red circles. At night, if lighted, these marks show a red light from each circle and a white light from the diamond.

Navigational aids in winter.—In winter, light vessels, light buoys, bell buoys, and whistle buoys are kept on their stations unless ice or weather conditions necessitate their withdrawal, when the buoys are in some cases replaced by spar buoys. They are replaced in the spring as soon as ice conditions permit.

In Norra Kvarken and Bottenviken, light buoys show their lights from about the beginning of August until the end of the navigation season.

In Bottenhavet, light buoys show their lights from the middle of July until the 1st of June, unless ice conditions necessitate their withdrawal.

In Södra Kvarken and its approaches, light buoys show their lights and are in position as long as ice conditions permit.

Radar reflectors.—Various buoys, marking channels, approaches, shoals, obstructions and wrecks may be equipped with radar reflectors.

Note.—Figure 4 presents graphically the system of markers in Swedish waters.

SIGNALS

ESTONIA

1-15 See information on U.S.S.R. given below.

U.S.S.R.

1-16 **Signal stations.**—There are signal stations at Kronshtadt and Leningrad which will communicate by the International Code of Signals and which display traffic, storm, ice, and water level signals. Certain other light stations and light vessels may make similar signals.

Radio communication may be made through the coastal radio stations.

Storm signals.—The signals in table 2 are in use in U.S.S.R. waters to indicate the weather expected. Beaufort scale wind forces are used. Storm warnings are also broadcast.

Ice signals.—See Table 4A, section 1-17.

Signals shown by certain light and signal stations.—Traffic signals regarding entry and departure of the port are the International Traffic Signals prescribed by the Lisbon Convention of October 23, 1930. These are the same as tabulated in Table 5 for Finnish ports. Special local signals are described in the related text.

Where harbors or ports are closed for military reasons, three *red* balls replace the three black balls displayed in the day International Traffic Signal indicating absolute prohibition of entry. See section 1-28.

Tidal signals are shown in table 3A.

Danger signals may be made from U.S.S.R. light vessels if a vessel is observed standing into danger. The International Code signal **JD** may be hoisted, and if not seen immediately, rockets with two explosions and bright stars may be fired every minute. Only the rockets are used at night.

U.S.S.R. light vessel signals when the vessel has broken from its moorings.—A U.S.S.R. light vessel that has broken from its moorings carries two black balls or two red flags by day, one at the bow and the other at the stern, and two red lights at night, one at the bow and the other at the stern. As an additional precautionary measure the vessel shows the International Code signal "PC" by day, and a red and white light, flashed simultaneously, or a blue light, every 15 minutes.

Pilot signals.—See section 1-23.

U.S.S.R. submarine operations.—Naval vessels of the U.S.S.R. which accompany submarines engaged in exercises display "HP" or "OIY" from the International Code of Signals. In addition, they transmit, whenever possible, on 600 meters the signal "ALZIV-ISCQU" meaning: "Your attention is directed to submarine(s)."

TABLE 2
STORM SIGNALS — U.S.S.R.

No.	Day	Night	Meaning
1	Black cone, point up.	Two red lights, vertical.	Wind force 8 or over, from N.W.
2	Black cone, point down.	Two white lights, vertical.	Wind force 8 or over, from S.W.
3	Two black cones, points up.	Red light over white light.	Wind force 8 or over, from N.E.
4	Two black cones, points down.	White light over red light.	Wind force 8 or over, from S.E.
5	One black ball.	One red light.	Wind force 6-7.
6	Two black balls, vertical.	Two red lights, horizontal.	Heavy squall.
7	One black cross.	Four red lights, at the angles of a diamond.	Hurricane.
8	One black T over another inverted.	One green light.	Wind force 4-5.
9	One black T, inverted.	Three red lights, at the angles of a triangle, point up.	Wind from N.W.
10	One black T.	Three red lights, at the angles of a triangle, point down.	Wind from S.W.
11	Two black T's inverted, vertical.	One red light over No. 9.	Wind from N.E.
12	Two black T's, vertical.	One red light under No. 10.	Wind from S.E.
13	One black flag or one black cylinder.		Wind expected to veer.
14	Two black flags or two black cylinders, vertical.		Wind expected to back.
15	Two black horizontal bars, vertical.		Weather predicted for to-morrow.
16	One black horizontal bar.		Weather predicted for to-day.

Notes on Table 2.—(1) Signals are displayed from signal masts as follows: Signals nos. 5-8, from the masthead; Signals nos. 1-4 and 9-12, from the left-hand side of the yardarm as seen from seaward; Signals nos. 13-16, from the right-hand side of the yardarm; when hoisted, Signals nos. 15-16 are displayed above 13-14.

(2) Signals nos. 1-4 indicate storms and storm direction; Signals nos. 5-8 indicate wind force; Signals nos. 9-12 indicate wind direction; Signals nos. 13-14 indicate shift in wind direction; Signals nos. 15-16 indicate forecast period.

(3) When Signals nos. 5-8 are displayed, wind direction is indicated by the simultaneous display of Signals nos. 9-12.

(4) Signal nos. 8 is displayed only in areas frequently navigated by small vessels for whom winds of force 4-5 are dangerous.

(5) Signals nos. 5 or 8 and 9-12 are lowered if wind is expected to increase to force 8 or more and replaced with Signals nos. 1-4 or 6-7 with 9-12.

(6) Signals nos. 13-14 are displayed, as necessary, with Signals nos. 1-4 and 9-12.

(7) Signals nos. 15-16 are displayed simultaneously, when appropriate, with Signals nos. 1-12.

(8) The absence of Signals nos. 15-16 from signal masts displaying weather signals indicates that the expected weather will set in during the next 12 hours.

(9) Signals nos. 15-16 are not displayed at night.

(10) The replacement of day signals with night signals and vice versa is made at sunrise and at sunset, respectively.

Vessels are cautioned to give a wide berth to any vessel making the above signals. If for any reason it is necessary to approach her, vessels should proceed at slow speed until instructions are given as to a safe course to steer. A good lookout should be kept for submarines, whose presence may only be indicated by their periscopes showing above water. It must not be inferred from the above that submarines exercise only when in company with escorting vessels.

In the event of emergencies, submarines of the U.S.S.R. may release two buoys in the form of a truncated cone painted red the emergent portion of which is distinguished by three alternating red and white sectors and a flashing white light. One buoy carries an "H" indicating the bow of the submarine; the other, a "K" indicating the stern. In order to establish contact, the cover of the buoy must be raised, the telephone receiver

removed and the call button pressed. When a reply is received, the button is released and voice contact is made.

Vessels engaged in surveying.—U.S.S.R. vessels, when engaged in surveying operations, fly a blue pennant having a white disk bearing the figure of a lighthouse.

Dredge signals.—See section 1-30.

FINLAND

1-17 Signal stations.—Certain of the Finnish light stations display pilot, storm, and water level signals.

Radio communication may be made through the Finnish coastal radio stations.

Storm signals.—Storm warnings are displayed at certain Finnish light and signal stations and are also broadcast. In table 4, strong wind means a force less than 8, Beaufort scale, and gale means wind force 8 or more.

Table 3A
TIDAL SIGNALS — U.S.S.R.

No.	Day	Night	Meaning
1	A black cone, point down	A <i>white</i> light over a <i>green</i> light	Low water.
2	A black cone, point up	A <i>green</i> light over a <i>white</i> light	High water.
3	A black cone, point down	A <i>green</i> light	Height above datum, 1 unit = 8 inches.
4	A black cylinder	A <i>red</i> light	Height above datum, 5 units = 3 ft. 3 inches.
5	A black ball	A <i>white</i> light	Height above datum, 25 units = about 16 ft. 5 inches.
6	A white cylinder	A <i>red</i> light	Height above datum, $\frac{1}{2}$ unit = about 4 inches.

Notes: The height of the tide above datum is measured in units of 20 centimeters (about 8 inches). Cones or balls indicating units may be in one or two

vertical lines.

The cylinder indicating one half of a unit may be hoisted below, or to the left of, the other unit signals.

TABLE 4
STORM SIGNALS — FINLAND

Day	Night	Meaning
One cone, point up One cone, point down Two cones, points up, vertical Two cones, points down, vertical One ball	Two <i>red</i> lights, vertical Two <i>white</i> lights, vertical A <i>red</i> light over a <i>white</i> light A <i>white</i> light over a <i>red</i> light One <i>red</i> light	Gale beginning in N.W. quadrant. Gale beginning in S.W. quadrant. Gale beginning in N.E. quadrant. Gale beginning in S.E. quadrant. Strong wind, direction unpredictable, bad weather.
Two balls, vertical One cylinder Two cylinders	Two <i>red</i> lights, horizontal	Gale, direction not given. Wind is veering. Wind is backing.

ICE SIGNALS.—See Table 4A.

PROHIBITED MOVEMENT SIGNALS, shown in table 5, may be displayed by certain light and signal stations in the vicinity of Finnish ports when any movement of vessels is prohibited in the approach or in an important channel.

WATER LEVEL SIGNALS may be shown in the vicinity of Finnish ports. Falling water level is indicated by a long slender cone, point down, by day and a white light over a green light at night. Rising water level is indicated by a similar cone, point up, by day and a green light over a white light at night.

DEPTH SIGNALS, indicating the height of water level above chart datum, are formed by the following symbols and lights as explained in table 6.

DANGER SIGNALS may be made from Finnish light vessels if a vessel is observed standing into danger. Rockets with two explosions and bright stars, may be fired every minute.

INTERNATIONAL ICEBREAKER SIGNALS.—

The signals shown in the table have been drawn up by the Inter governmental Maritime Consultative Organisation, and are used by the icebreakers of Norway, Sweden, Denmark, Finland, the Federal Republic of Germany, the Soviet Zone of Occupation of Germany, Poland, and the U.S.S.R. Canada also uses these signals.

Icebreakers of Norway, Sweden, Denmark, and Finland use certain signals only, namely: A, P, N, H, S, and Y.

These single-letter signals, when made between an ice-breaker and assisted vessels have only the significations given in this table and are only to be made by sound, visual signals or radiotelephony.

The use of these single-letter signals is introduced and finished respectively by one of the following two-letter groups:—

WM Ice-breaker support is now commencing. Use special ice-breaker support signals and set continuous watch for sound, visual and radio-telephone signals.

WO Ice-breaker support is complete. Proceed to your destination.

TABLE 4A
INTERNATIONAL
ICEBREAKER SIGNALS

Code letter or figure	Signification	
	When made by the ice-breaker	When made by a vessel or vessels being assisted
G — — •	I am going ahead; follow me.	I am going ahead; I am following you.
A • —	Go ahead (proceed along the ice channel).	I am going ahead (I am proceeding along the ice channel).
J • — — —	Do not follow me (proceed along the ice channel).	I will not follow you (I will proceed along the ice channel).
Q — — • —	Shorten the distance between vessels.	I am shortening the distance.
B — • • •	Increase the distance between vessels.	I am increasing the distance.
P • — — •	Slow down	I am slowing down.
N — •	Stop your engines.	I am stopping my engines.
H • • • •	Reverse your engines.	Reverse your engines.
L • — • •	You should stop your vessel instantly.	I am stopping my vessel.
4 • • • • —	Stop. I am ice-bound.	Stop. I am ice-bound.
5 • • • • •	Attention.	Attention.
Y — • — —	Be ready to take (or cast off) the tow line.	I am ready to take (or cast off) the tow line.

SPECIAL CASE.—Finnish and Swedish ice-breakers do not make signals by radiotelephony.

The following single-letter signals may be used during icebreaking operations:

E (●) I am altering my course to starboard.

I (●●) I am altering my course to port.

S (●●●) My engines are going astern.

M(— —) My vessel is stopped and making no way through the water.

The above signals namely E, I, S, and M, when made by sound, may be made only in compliance with the requirements of the International Regulations for Preventing Collisions at Sea. The use of any signal shown in the table does not relieve Masters from the responsibility of complying with the International Regulations for Preventing Collisions at Sea.

Special signals:

The signal K (— ● —) by sound or light may be used by an icebreaker to remind ships to keep a continuous radio watch.

The signal (●● — ●●) by sound or light may be given by an icebreaker only, to stop the headway of a vessel in the ice channel ahead of and approaching, or going away from the icebreaker.

Special case ● — The above signal, (●● — ●●), may be given by a ship to a U.S.S.R. icebreaker and shall mean, "I have ceased going ahead".

When several vessels are being assisted, the distance between ships in the ice channel should remain constant; a vessel unable to maintain speed may alert following vessels by giving the "Attention" signal.

GENERAL PROCEDURES.—Vessels to whom assistance can be given will be given details by the Ice Service, which may entail routing to a different port. The ice-breaker should be contacted by radio direct, or through the nearest coast radio station; its instructions should be carefully followed. Vessels considered unsuitable for ice navigation will be advised not to continue their voyage.

A vessel requiring icebreaker assistance shall display vertically; by night, 2 red lights; by day, 2 black balls.

All other communications shall be made by radio or the International Code of Signals.

All vessels being convoyed by a government icebreaker are subject to the authority of the icebreaker so long as the service continues. During the time of this service all vessels are to comply with the directions given them by the icebreaker.

If several ice-breakers are working together, the Master of the one with the most powerful engines is to be considered the leader, and, unless other arrangements are made by the Harbour

Master, his instructions are to be carried out by the other ice-breakers.

Ice-breakers are equipped with both bass and tenor sirens. Signals made by tenor siren apply only to the ship nearest to the ice-breaker. Signals made by bass siren apply to all ships being assisted, and may also be made by a light synchronised with the siren; these signals should be repeated, in sequence, by all ships.

Icebreakers exhibit an all round blue light at the masthead.

Any vessel assisted by a government icebreaker must comply with the following rules:

1. The engines must have immediate and full reverse propulsion power.

2. Ships being convoyed by an icebreaker are not to pass each other unless directed to do so by the icebreaker.

3. Ships being towed shall not use their screws, except when directed by the icebreaker. The towline is to be made fast in a way that it can be quickly cast off; there must always be a man stationed ready to let go this line.

4. Any damage to the ship that may affect the continuation of the voyage must be reported immediately to the icebreaker.

Aircraft may be used to assist the icebreaking service. At such times it is important that escorted vessels attend to the following:

1. The vessels largest ensign is to be displayed.

2. The name and port of registry of the vessel should, as far as possible, be painted in letters at least 20 inches high, preferably on the ships side, otherwise on the hatch tarpaulins, canvas, or the like, placed in a position easily seen from the air.

3. When aircraft appear, the vessels destination should be displayed.

4. All signalling shall be as brief as possible.

5. Signals shall not be displayed from the masthead. When several signals are shown simultaneously they shall be well separated.

6. Ships fast in the ice may, by means of slag, ashes, and such, write their communication on white ice in letters about 40 inches long.

7. If distress signals are displayed, the nature of distress shall be indicated.

8. Signals acknowledged by aircraft will be indicated by firing a white Very light.

9. When aircraft are in sight, vessels should tune in on a wave frequency of 500 kilocycles. Mariners are advised that the frequency of aircraft may vary considerably.

10. Message drops may be used by the aircraft to communicate with the vessel. The message block, a rubber container, should be returned as soon as possible to a pilot, customs, or harbor authority.

TABLE 5
PROHIBITED MOVEMENT SIGNALS — FINLAND

Day	Night	Meaning
Three vertical balls	Three vertical red lights	Entry absolutely prohibited. Used in cases of serious emergency. Entry prohibited.
Cone, point up between 2 vertical balls	White light between 2 vertical red lights	Entry and departure prohibited.
Ball under 2 cones, points toward each other	White light under a green light and over a red light	Departure prohibited.
Cone, point down, under 2 cones, points toward each other	White light between 2 vertical green lights	

TABLE 6
DEPTH SIGNALS — FINLAND

Day	Night	Meaning
Ball or cone, point down	White or green light	One unit of 2 decimeters (about 8 inches).
Cylinder	Red light	Five units or 1 meter (about 3¼ feet).
Ball	White light	Twenty-five units or 5 meters (about 16¼ feet).
Cylinder	Red light	One half unit or 1 decimeter (about 4 inches).

Balls or cones indicating single-unit heights are exhibited in one or two vertical hoists. Cylinders which indicate five-unit heights are exhibited in a vertical hoist to the right of the single unit hoist. A ball indicating a 25-unit height is exhibited farthest to the right. A cylinder indicating a half-unit height is hoisted under the single-unit hoist or to the left of it. Corresponding night signals are hoisted in a similar manner. Right and left refer to the respective sides of an entering vessel.

Finnish light vessels out of position cease their characteristic signals and show the same signals described for Swedish light vessels out of position (sec. 1-18).

Pilot signals.—See section 1-24.

SWEDEN

1-18 Signal stations.—Certain of the

Swedish light stations display pilot and current signals.

Radio communication may be made through the Swedish coastal radio stations.

Storm signals.—Storm warnings for that part of the Swedish coast described in this volume are given only by radio.

Ice signals.—See table 4A, section 1-17.

Distress signals may be shown from **Green Light Vessel** (sec. 6D-6) as follows:

1. A cylinder indicates that a vessel is in distress.

2. A ball over a cylinder indicates that a doctor is required at the light vessel.

3. A cylinder over a ball indicates that communication with land is desired.

Danger signals may be made from Swedish light vessels if a vessel is observed standing into danger. A gun may be fired, the Morse letter "U" may be made by siren or flashing light, or the International Code flag "U" may be hoisted.

Swedish light vessels out of position show by day the International Code signal "PC" and two black balls, one forward and one aft, unless that is the normal daymark, in which case red flags may be used. At night they carry two red lights, one forward and one aft, and show two flare-up lights, one white and one red, simultaneously every 15 minutes.

Pilot signals.—See section 1-25.

Dredge signals.—In Swedish waters the following signals are made by dredges at work: By day:

A black double cone on that side of the dredge which vessels may pass.

A red ball on that side of the dredge which vessels may not pass.

A red and blue flag, divided diagonally, denotes that a diver is at work, and vessels must pass with caution and, as far as navigation permits, with their engines stopped at night:

A white light above a green light on that side of the dredge which vessels may pass.

A white light above a red light on that side of the dredge which vessels may not pass.

In thick or foggy weather:

Double strokes of the bell every minute indicates that vessels should pass northward or eastward of the dredge.

Treble strokes of the bell every minute indicates the vessel should pass southward or westward of the dredge.

Customs signals.—All vessels navigating in Swedish waters are subject to customs inspection. Customs vessels display, in addition to the Swedish ensign, a blue triangular flag which has a "T" under a crown, both yellow in color. At night the vessels

show an alternate yellow and blue light from a duplex lantern. If the vessels do not stop when the above signals are made, the customs vessel will display the International Code flag "K" by day, or make the letter "K" in Morse code by signaling at night. If the latter signals are disregarded, the customs vessel may fire a blank charge, or sound a succession of short blasts on the whistle.

Speed when passing certain Swedish light stations.—A red ball shown in the rigging of a vessel lying at a light station indicates that passing vessels must not proceed at a speed greater than 5 knots for a distance of 100 yards on each side of the moored vessel.

Minesweeping signals.—Swedish naval vessel engaged in minesweeping, towing sweeping gear, or ships on trial runs for the purpose of making safety arrangements against magnetic mines will show the following signals:

1. When engaged in minesweeping—

By day.—A black ball at the foremast head and a similar ball at the yardarm on the side or sides on which the sweeping gear is towed.

At night.—Green lights displayed in a manner similar to the balls.

2. When minesweeping gear is being towed but is not being used for sweeping—

By day.—The International Code flag "D" shown at the foremast head.

At night.—Three lights shown vertically at the foremast head; the upper light is red, the middle light is white, and the lower light is green.

3. Vessels on trial runs for the purpose of making safety arrangements against magnetic mines will show signals described in (2) above. In addition, a white light will be shown from the craft which is being towed.

Swedish minesweepers engaged in acoustic minesweeping may warn approaching vessels by flashing Morse Code letter "U" in their direction. A minesweeper making this signal should not be approached within at least 1½ miles.

Vessels engaged in destroying mines or rendering mines safe will display: by day, a red flag; by night, a red light. Such vessels should be given a wide berth.

Vessels engaged in minesweeping are not to be approached within a distance of about

$\frac{1}{4}$ mile, and ships are not to cross their courses within a distance of about $\frac{1}{2}$ mile. Under no circumstances is a vessel to pass through a formation of minesweepers, or between the minesweeper and the buoy following it. Vessels engaged in towing minesweeping gear or in making trial runs in connection with safety arrangements against magnetic mines are not to be approached within a distance of 200 yards.

Swedish submarine operations.—When Swedish submarines are practicing, the vessels conveying them will fly flags "HP" at the masthead, accompanied by a group from the numeral table in the International Code indicating the number of submarines in the company. The signal is a warning to vessels that submarines are in the vicinity; vessels observing it should give a conveying vessel a berth of at least a mile if possible, and keep a good lookout for submarines whose presence may only be indicated by their periscopes above water. They should also navigate with care, as submarines rising are not always in a condition to maneuver immediately, or to show the proper signals for a vessel not under control.

Swedish submarines are equipped with rising and telephone buoys as aids to the vessels in case they should sink. Rising buoys are can-shaped, painted red with a dark green lid and are designed to assist members of the crew to rise through the water from a sunken submarine.

Telephone buoys are also can-shaped and painted orange with a white lid, which is fitted with a ring and an electric lamp by which messages in the Morse Code can be communicated by the submarine. Each buoy carries a plate on which are inscribed the name of the submarine and instructions how to proceed.

When a rising buoy is found it shall not be touched; however, its inscription shall be noted. When a telephone buoy is found the instructions shall be carefully carried out and an attempt be made to communicate with the crew of the sunken vessel. Great care shall be exercised in order not to damage the buoys and their wires and cables. If a buoy for some reason should be damaged or torn

away, its previous position should be carefully noted.

Any vessel sighting such a buoy should immediately notify naval vessels in the vicinity, and a pilot or a government office on shore, at the same time communicating the position, name of the submarine, and the telephone message received from the submarine. Merchant vessels should also, if possible, communicate with the naval station at Stockholm.

Swedish submarines submerged for long periods without showing their periscopes may tow a small buoy, painted in orange and white horizontal bands and surmounted by a small flag, to indicate their positions and to warn vessels in the vicinity that a submarine is about to surface; in addition to this buoy a submarine may also tow a telephone buoy. A vessel sighting either orange and white buoy or the signal flag should pass astern of it.

A submarine submerged at night, and about to surface, may indicate her position by towing a telephone buoy from which a flashing white light is exhibited.

Swedish submarines under way may exhibit (a) in place of the white lights mentioned in Rule 2 (a), paragraphs (i) and (ii) of the International Regulations for Preventing Collisions at Sea, a blue light on the fore staff and a white top light in another suitable position. Both lights will be constructed as in paragraph (i).

(b) In addition to the side lights mentioned in Rule 2 (a), paragraphs (iv) to (vi) of the above regulations, Swedish submarines may carry a second side light on each side of the submarine, either above or below the first side light.

GENERAL SIGNALS

1-19 Firing and bombing danger areas, mining exercise areas.—See section 1-31.

Signal to be made by vessels when inconvenienced by searchlights.—In the event of a vessel being inconvenienced by the glare from searchlights near any port should make the International Code signal "ZO" (— — .. — — —) by lamp and by whistle, siren, or fog horn.

Both the light and sound signals should be employed whenever possible and should be repeated until the inconvenience is removed.

Only real urgency should necessitate the use of this signal.

1-20 and 1-21.—Note: Information about special United States regulations, signals, rescue operations, and other cautions previously contained in Chapter I of this text is now included in Notice to Mariners No. 1 of each year.

PILOTAGE

ESTONIA

1-22 Pilotage is compulsory for the ports of Narva Jõesuu and Tallinn, and government pilots are available. Other ports may not require pilots, but private pilots are available. The pilot stations are described with the particular coastal section. International Code pilotage signals are used.

U.S.S.R.

1-23 Pilotage is compulsory for merchant vessels at all ports of the U.S.S.R. where a pilotage service is maintained. Special regulations are in force with regard to naval vessels. Pilots can be obtained from the stations described with the particular part of the coast. See regulations for entering U.S.S.R. ports, including special signals (sec. 1-28).

Pilot signals of the International Code, are used to request a pilot. If the pilot can be obtained, the pilot flag is hoisted at the station; if not, a ball replaces the pilot flag. International Code signals are used for communication with the pilot station. Where the pilot station is operative, the pilot vessel or light vessel carrying the pilots will answer the request for pilotage by the following signals:

By day, the No. 1 pennant of the International Code and at night, a light alternating white and red means that a pilot is being sent.

By day, the No. 2 pennant of the International Code and at night, two vertical white lights mean that a pilot is not available.

The following extracts are taken from the Russian Baltic Pilot, 1944:—

The State sea pilots carry out the following duties:

- (a) The bringing in of ships.
- (b) The taking of soundings.
- (c) The observing of the state and accuracy of channels.

- (d) Noticing that, while bringing in ships, no photographs of the approaches to the place are taken and that no soundings in the fairway are taken by any gear other than the hand lead.

Pilots are forbidden to communicate to strangers descriptions or particulars of the fairway.

The pilot must appear on board immediately he is summoned by the master. The master must take all measures for the quick and safe reception of the pilot and for the preservation of his own ship.

The pilot is forbidden, without the consent of the master, to leave the ship before he has brought her to a safe place, or taken her out to the open sea or turned her over to another pilot.

The presence of the pilot on board does not relieve the master from the responsibility for the navigation of the vessel.

Should the master leave the bridge he must point out to the pilot who is responsible for the navigation of the vessel during his absence.

FINLAND

1-24 Pilotage is compulsory for all foreign naval and merchant vessels navigating in Finnish waters. If a government pilot, who has been duly summoned, fails to present himself, the pilotage may be performed by another person, but no further than the next pilot station. In such cases the prescribed signal for a pilot should be shown until a government pilot has taken over the pilotage.

In the case of vessels leaving a harbor, the pilot station must be notified at least one day in advance. In other cases the pilot can be summoned by the customary pilotage signals of the International Code.

A pilot may be called by day by the following signals:

- (a) International signal flag "G".
- (b) International signal flags "PT".
- (c) National pilot flag on the foremast.

By night the following signals may be used:

- (a) A blue flare shown every 15 minutes.
- (b) A white flag shown above the bulwarks at short or long intervals.
- (c) International letters "PT" by flashing light.

Pilot stations will answer a vessel's signal for a pilot by hoisting a flag by day and with a flare or a white light at night if a pilot is available. A ball by day indicates that a pilot is not available.

Finnish pilot vessels and boats and light vessels with pilots on board fly a horizontally

divided white-red flag, and in addition a sailing pilot vessel has a red cloth in the center of one of its sails. At night pilot vessels show an alternating red and white light signal to approaching vessels, except that a light vessel with pilots on board will show a blue flare in lieu of the above night signals.

If a pilot is unable to board a vessel because of bad weather or other reason, he may direct the vessel by the same signals for such a situation as described under the Swedish pilotage signals.

SWEDEN

1-25 Pilotage is compulsory in Swedish waters for foreign naval vessels, and there are special regulations regarding them.

Pilotage is compulsory for all merchant vessels, with, among others, the following exceptions:

- (a) Vessels whose dutiable tonnage does not exceed 100 tons.
- (b) Vessels employing an ice breaker for ice breaking.
- (c) Vessels calling at Swedish harbors or anchorages for provisions, coal, on account of death or sickness on board, or bad weather, provided they only land sick passengers or dead and only take on provisions, coal, or other stores for the vessel's own use.

The pilot service is divided into districts, each under a pilot captain. The two districts included in this volume are the Lower Northern, with headquarters at Gavle, and the Upper Northern, with headquarters at Umea.

Only State pilots should be employed. If they cannot be obtained any other person taken in case of necessity must only be employed as far as the nearest pilot station. State pilots, when on service, wear a brass plate, with a crown over the word "Kronolots."

When a pilot wishes to communicate with a vessel he will by day wave the pilot flag on both sides and at night show alternate white and red light signals. Vessels must then heave to or stop to communicate with the pilot.

The most important stations are equipped with decked motor boats in which the pilots meet vessels at sea, so that even in bad weather the prompt arrival of a pilot can be reckoned on. Less important stations have only small boats. In such cases the signal for a pilot should be made in good time, and the vessel should await his arrival outside the shoals.

Should the pilot be unable to board a vessel because of bad weather or for any other reason, the following signals will be made from a boat or other place in the vicinity, with a flag or other distinctive sign:

Held horizontally...Alter course in the direction indicated.

Held upright.....Steady.

Waved from side to

side.....Heave to, or stop.

At certain stations a black ball with a white band is displayed from a signal mast to indicate that pilots are available and will board a vessel showing the pilot signal as quickly as possible. When all pilots are out, the ball is lowered.

Swedish pilot vessels carry the International Code of Signals flag "H" at the masthead or other conspicuous place. At night, in addition to the white light over a red light they show an alternating red and white light to approaching vessels. Light vessels with pilots on board display at the gaff or at some other conspicuous place the above flag by day and a white light at night.

Pilot signals of the International Code are used to request a pilot. The sound signals, when used, are answered from the pilot vessel by either a series or three closely spaced long blasts made on the whistle, siren, or foghorn to indicate that a pilot is coming out.

REQUEST FOR PILOTAGE.—In March 1964, The Swedish Board of Shipping and Navigation, Stockholm, issued a leaflet concerning requests for pilots when entering Swedish waters. These instructions are reprinted below:

"The net of permanent VHF telephone stations of the Maritime Service has now been enlarged to cover practically all pilotage attendances as well as a number of light-houses.

The radio stations are made for frequency modulations and may be used by vessels for requests for pilots. When the pilot stations are open the frequency 156.80 Mc/s (channel 16) is being watched, which frequency should be used for calling and replying and also for transmissions in case of emergency.

Radio transmissions concerning the usual traffic, i.e., requests for pilotage and the like, should subsequently be made on the general frequency of 156.65 Mc/s (channel 13) or on the reserve frequency of 156.60 Mc/s (channel 12). The optical pilotage attendance at some of the pilot stations has already been discontinued, and pilots therefore have to be asked for by radio and/or by telephone. If radio is used, the request for the pilot can be made either by means of the VHF telephone stations direct to the pilotage station in question or to any other pilotage or lighthouse station equipped with VHF, or via the radio stations for the usual traffic of the Telegraph Service. These radio stations will at a certain cost transmit the radio call via the telephone net to the pilotage station concerned.

As a means toward improving the pilot service, and in order to eliminate the risk of the vessels having to wait for pilotage service, all masters of vessels intending to use a pilot are requested to state this to the pilot station concerned well in advance, i.e., at least five hours before the time the pilot is

expected to board the vessel, either direct or via another pilot station, or through a ship agent via the coastal stations of the Telegraph Service. In such a message the name of the vessel, her draft and destination should be given, as well as the time the pilot is required on board, and the route if there are alternates.

At least two hours advance notice must be given of any alteration in the vessel's time of arrival at the pilot station. This will considerably improve the possibilities of using the pilots rationally, thereby also improving the service to the vessels. The message referred to will entitle the vessels to a certain priority in respect to obtaining pilotage."

If a vessel arrives more than one hour later than the time notified, the previous request will be regarded as having lapsed.

REGULATIONS

QUARANTINE—GENERAL REMARKS

1-26 No vessel coming from a foreign port to waters adjacent to any of the countries within the limits of this volume is allowed to physically communicate with the shore, except in case of emergency, nor may any person leave the vessel until permission has been obtained from the quarantine officer of the country concerned.

ESTONIA**1-27 See regulations for U.S.S.R.****U.S.S.R.**

1-28 Territorial waters.—The U.S.S.R. considers its territorial waters to be within a limit of 12 miles from its coasts and from the islands which border its coasts. Foreign vessels have freedom of navigation within these limits, except in certain prohibited zones which are published in the Russian Sailing Directions, Notices to Mariners, and Port Decrees (sec. 1-32). Vessels are permitted to enter only in those ports which have customs authorities.

Where entry or the navigation in territorial waters is prohibited, coast guard stations and vessels are designated for examination purposes. A sharp lookout should be maintained for any such vessel or station which will display a blue triangular flag by day and three blue lights, vertically disposed, at night. Signals shown by the vessel or station to indicate that entry or navigation in an area is prohibited are three red balls, vertically disposed, by day, and three red lights, vertically disposed, at night.

Signals made by U.S.S.R. authorities with foreign vessels are in the International Code of Signals. Any vessel that is in territorial waters and within signalling distance of a U.S.S.R. signal station in the daytime must hoist its national flag and show its call letters by the appropriate flags of the International Code of Signals; at night, when requested, the ship's call letters are signalled in Morse Code.

Special regulations are in force concerning the use by foreign vessels of their radio installations when in U.S.S.R. waters.

Fortified zones.—The following regulations apply to all merchant vessels in relation to passage in military zones the limits of which are published in the Russian Notice to Mariners.

1. A merchant vessel coming from the exterior may not enter a military zone without previous authorization. If a merchant vessel with destination to an open port (such as Leningrad) must pass through the military zone, the vessel receives special instructions for the passage.

2. A vessel may not enter into a military zone without a pilot, and the vessel must conform to all orders of the pilot.

3. By day, the vessel must display its national ensign, its house flag, and its call letters.

At night, any merchant vessel must carry only the prescribed lights, unless specifically ordered to darken them, or unless the pilot decides otherwise.

4. A vessel traversing the military zone must not anchor less than 600 yards from the middle of the channel or the route prescribed.

5. Any merchant vessel must give the right of way to naval vessels and not obstruct their maneuver.

6. In foggy weather, passage through a military zone is prohibited to merchant vessels.

1-29 Harbors.—Foreign merchant vessels are permitted only to call at one of the recognised ports of entry where Customs stations are established. Leningrad, Gavan Vuras (Vysotsk), Vyborg, and Tallinn are the only U.S.S.R. ports of entry in the Gulf of Finland. When a harbor is closed for military reasons, the signal consisting of three red balls by day or three red lights, vertically disposed, at night is displayed from the light vessel near the entrance or from a conspicuous place on land. In such cases, vessels must anchor outside the port or put to sea again.

Harbor entry is forbidden in foggy weather or during a heavy snowfall unless previous arrangement has been made by radio. If a gun or rocket signal is fired by a shore battery, vessels must stop immediately and heave to. Patrol vessels wishing to stop a vessel will hoist, by day, the established International Code Signal and, at night, show two green lights, vertically disposed, above the masthead light. Any vessel to which these signals are made must stop and not proceed until permission is given to do so.

Traffic signals in the various ports are the International Traffic Signals prescribed by the Lisbon Convention of October 23, 1930. The following supplementary signal may also be used: a black ball between two black cylinders by day or a red light between two white lights by night signifying that movement of harbor craft and small boats is prohibited. Special signals in the various ports are described with the related text.

The coastal radio station open to public correspondence in the U.S.S.R. area described in this volume is at Leningrad. Prior to arrival, messages should be

addressed to INFLOT LENINGRAD giving name, nationality, and destination of vessel.

REGULATIONS.—Quarantine.—U.S.S.R.—Vessels approaching ports of the U.S.S.R. from abroad must hoist the appropriate quarantine signals described in the International Code of Signals. The quarantine flag must be displayed until pratique has been given by the quarantine officer, when it must be hauled down; until the lowering of the quarantine flag, entry to the ship is prohibited to everyone except pilots and medical personnel.

After the quarantine flag has been hauled down the various Government and Port officials, also the Agent for the vessel, will come on board. Until the Customs examination is completed, no one is permitted to leave the vessel.

1-30 Dredgers in U.S.S.R. waters.—A dredger working in a channel or fairway or in other areas on shipping routes must at all times when it is working show the following signals in addition to the lights and signals for a vessel at anchor required by the International Regulations for the Prevention of Collisions at Sea:

1. On the side on which a vessel must not pass:

By day.—A black ball and under or over it a black cone point up.

By night.—Two red lights, vertically displayed, visible all around for a distance of not less than 2 miles.

On the side on which a vessel may pass:

By night.—Two green lights, vertically displayed, visible all around for a distance of not less than 2 miles.

2. If a vessel may not pass on either side the dredger will show on both sides:

By day.—A black ball and under or over it a black cone point up.

By night.—Two red lights, vertically displayed.

3. If the dredger is working at right angles to the axis of the channel or fairway, or nearly so, she must show the appropriate signals for passing where they best indicate the side on which a vessel may pass.

4. A dredger working in fog will ring her bell followed by 3 long blasts on her whistle.

5. A vessel wishing to pass a dredger should, when about $\frac{1}{2}$ mile away, sound one prolonged blast on her whistle which indicates an inquiry about the possibility of passing. The dredger, on hearing this signal, will indicate the side on which she may be passed as follows:

One long blast.—Keep to the right of the channel.

Two long blasts.—Keep to the left of the channel.

Three long blasts.—The passage is closed; wait until clear.

Vessels passing a dredger must do so at the slowest speed required to maintain steerage way.

If there is no answering sound signal from the dredger the approaching vessel must assume that there is no free passage.

Vessels passing a dredger must not overtake one another.

Vessels passing a dredger must not tow a hawser or chain on the bottom nor may the anchor be carried below the forefoot.

A dredge displays a white pennant with a light blue horizontal band superimposed on a red star in a white circle.

SWEDEN

1-30a Forbidden zones.—Several areas within the territorial waters of Sweden have been set aside as forbidden zones. Except in case of need, no foreign vessel may enter these zones without special permission granted by competent authority. The commanders of vessel with permission to transit such zones are required:

1. To have on board properly qualified pilots;

2. To navigate extensively within channels designated by competent authority;

3. To accept military personnel which may be ordered on board;

4. To keep below decks all those not directly concerned with the safe navigation of the vessel.

CAUTIONS

DANGER AREAS

1-31 Firing, bombing, and mining exercise areas.—Such areas lie within the limits

of this volume, however due to the responsibility of the range authorities for avoiding accidents, the limits of the practice areas may not be described in this volume. Warnings may be broadcast by radio or indicated in the vicinity of the area.

Restricted areas.—There are certain restricted areas within the limits of this volume which are indicated with that part of the coast in which they are located. Other restricted areas may be indicated by local radio broadcast or other warning.

Several areas within the territorial waters of Sweden have been set aside as protected zones. As a rule, foreign vessels must remain within the generally used channels where they are subject to local regulations which may limit layover time to a maximum of three days. Permission to extend the period of stay may be obtained. Restricted and semi-restricted areas within the limits of this present volume are as follows:

1. The Soderarm restricted area, the outer limit of which extends from Arholma (59° 50' N., 19° 07' E.) northward to Tjarven and then to Simpnasklubb lighthouse (sec. 6A-6).

2. The Singo restricted area, in the eastern approaches to Oregrund, including the islands of Singo, Vassarö, Bodskar, Norrskar, Understen, and Halsaren, with the channels on the northeastern side of Singo.

3. The Hemso semi-restricted area, which comprises all waters westward of a line joining the eastern extremity of Harnon to the northeastern point of Storon, and then north-northwestward to the coast. Within this area is Homso restricted area, including the islands of Lungö, Hemso and Storon, and the channels through Lungösundet and northward and southward of Storon.

4. The Kalix-Boden semi-restricted area, which comprises all the waters and offlying islands in the approaches to Luleå, Torefjärden, Kalixälven and Sangisfjord between Morön and Malören. Within this area is Kalix restricted area, including the waters of Torefjärden northward of the southern end of Fåröarna.

Mined areas.—Nemedri (North European and Mediterranean Routing Instructions) should be consulted for the latest information concerning areas which are dangerous because of the risk of mines. It indicates the limits of and channels through some of the mined areas lying within the limits of this present volume of Sailing Directions.

In this regard, it is sufficiently detailed to provide safe entry as far as the pilot station or anchorage where vessels may obtain further information.

Mined areas exist along the Swedish coast of the gulf of Bothnia. These areas lie in the channel between Arholma and Björkö and in the approaches to Gävle, Hudiksvall, Sundsvall, Sannasundet, Angermanälven, Ornskoldsvik, Umeå and Luleå.

U.S.S.R. authorities recommend that vessels entering U.S.S.R. controlled ports should be degaussed or wiped. Although disregard of this recommendation does not prohibit the entry of undegaussed vessels, such vessels do so at their own risk.

Radio navigational warnings.—Such warnings should be obtained for the most recent information on the above danger areas.

U.S.S.R. HYDROGRAPHIC INFORMATION

1-32 Warning concerning lack of hydrographic information.—The U.S.S.R. does not fully participate in the international practice of exchanging hydrographic information, and it is therefore no longer possible to ensure that Oceanographic Office charts and publications covering the coasts of the U.S.S.R. and adjacent waters are up to date in regard to new dangers or change in navigational aids and warnings. Mariners should exercise additional caution when navigating in such waters.

SINGLE SHIPS APPROACHING SQUADRONS

1-33 The attention of mariners is called to the danger to all concerned when a single vessel approaches a squadron of naval vessels or merchant ships in convoy so closely as to involve risk of collision, or attempts to pass ahead of or through such a squadron or convoy. Mariners are therefore warned that a single vessel should take early action to keep out of the way of a squadron or convoy.

The fact that it is the duty of a single vessel to keep out of the way of a squadron or convoy does not entitle those vessels in company to proceed without regard to the movements of the single vessel. Vessels in a squadron or convoy should accordingly keep careful track of the movements of any single

vessel approaching and be ready to take such action as will best avert collision in case the single vessel does not keep out of the way.

Attention is also invited to the uncertainty of the movements of aircraft carriers which must turn into the wind when aircraft are taking off or landing.

SUBMARINE CABLES

1-34 Submarine cables are laid within the area covered by this volume, and because of the serious consequences resulting from damaged submarine cables, special care should be taken to avoid anchoring or fishing in cable areas. Vessels fouling a submarine cable should attempt to clear it without damage to the cable. Anchors or gear that cannot be cleared should be slipped and abandoned, and no attempt should be made to cut a submarine cable. Certain cables carry high voltages and serious injury or loss of life may result from attempting to cut it.

The owners of vessels which are able to prove that they have sacrificed an anchor or other gear in order not to damage a submarine cable may be compensated for such loss by the owner of the cable. In order to establish right to such compensation it is necessary if possible, immediately after the accident, to draw up a report confirming the loss, together with supporting testimony of men in charge of the equipment. Within 24 hours of the vessel's arrival in or return to port, the master must make his report of the loss to the proper authorities, who will notify the consular authorities of the country of the owner of the cable.

OCEANOGRAPHY

GENERAL REMARKS

1-35 Although tides in the Gulf of Bothnia and the Gulf of Finland are negligible, periodic fluctuations in water level occur

under the influence of wind, atmospheric pressure, and river discharge. Local currents, mainly of wind origin, are found in the numerous channels and sounds of both these gulfs.

Fresh-water drainage reduces the sea surface salinity to less than 2‰ at the head of each of these gulfs. The salinity increases gradually to about 6‰ at the mouths and very little more in the Baltic Sea proper. Density increases toward the center of the gulfs and toward the Baltic Sea. Sea surface temperatures vary with the seasons and are generally lower than those found in the Baltic Sea, where the maximum summer temperature is 60°F.

Bottom sediments in the gulfs are patchy. Near shore they consist of all types from soft through hard, whereas at the center they consist of mud-and-sand grading into mud.

TIDES

1-36 Periodic tides in the Gulf of Bothnia and the Gulf of Finland have a range of less than 4 inches. Thus, the tidal range can be ignored since it is completely masked by larger seasonal variations in sea level from other causes.

In this region variations in water level generally are caused by meteorological influences. Usually there is high water on the coast toward which the wind is blowing and low water on the opposite coast. Local changes from this rule can be caused by irregularities in the shape of the coast, such as large bays, inlets, reefs, or islands. Severe gales are not common, but when they do occur, they may cause an accumulation of water resulting in great floods in some localities, while shoals usually covered by several feet of water on the opposite shore become dry.

The effect of atmospheric pressure, although weaker than that of the wind, is local and felt more quickly. A low barometer causes the water to rise slightly and, in restricted areas, may set up periodic oscillations (seiches) which cause variations of the water level. A high barometer causes the water level to fall slightly and may likewise result in a seiche.

In general, variations of water level due to meteorological influences will be greater in bays and narrow waters than on the open coast where there are no obstructions to water movements. The changes are relatively smaller in the summer months, probably because storms seldom occur at this time of year.

There are also changes in water level brought about by changes in the actual water volume of the Baltic Sea. This change in volume is due principally to the influences of the inflow and outflow of water through the Danish sounds. Water volume also is changed by variation in the runoff of the many rivers that drain into the Baltic. Changes in level from these causes occur very slowly, the maximum rate being about 10 cm. per day.

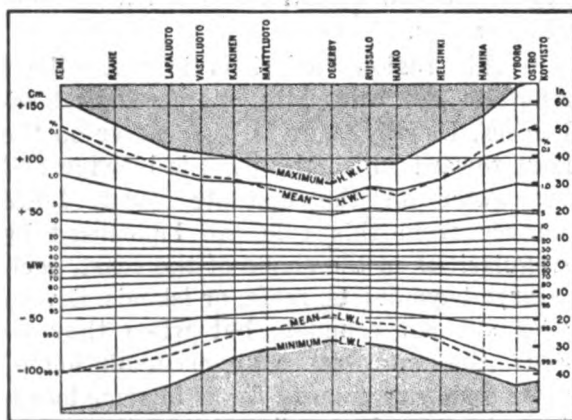


FIGURE 6 FREQUENCY DISTRIBUTION OF HEIGHTS OF WATER LEVEL AT VARIOUS TIME-STAGE STATIONS

Heavy transverse lines show for any station the percentage of time during which actual water level has exceeded the height plotted on the grid. Percentages for places on the coast between stations can be approximated by interpolation.

The frequency of occurrence of changes in water level is shown in figure 6.

CURRENTS

1-37 The general pattern of circulation is counterclockwise in both gulfs and in the Baltic Sea as shown in figure 7. The current sets southward along the Swedish coast, and northward out of the Gulf of Finland along the Finnish coast.

The water level of Ladozhskoye Ozero (Lake Ladoga) is 14 feet higher than that of the Gulf of Finland at Kronshtadt. A current of $1\frac{3}{4}$ knots often runs in the Neva through Leningrad Harbor and may increase to 3 knots with a northerly wind.

Wind-driven currents attain velocities of as much as 2 knots in the open sea and 4 knots near shore during gales. They usually set with the wind, but also may set at any angle to it and even directly to windward. Such currents result when the wind has been blowing from the opposite direction for some time previously or in a different generating area from that in which the currents occur.

Although a current usually flows out of the Gulf of Finland, during westerly or southwesterly winds currents flow eastward, parallel to the shores, at velocities as great as $1\frac{1}{2}$ knots. During northerly winds, the water flows into the bays on the southern side of the Gulf of Finland.

In the Gulf of Bothnia the currents are dependent chiefly on the wind. After strong southerly gales have driven water into the gulf, strong currents will be found setting southward. The strongest current will be encountered in the vicinity of Åland Islands.

TEMPERATURES, SALINITY, AND DENSITY

1-38 General remarks.—The density of sea water is controlled by its temperature

and salinity. These factors may have an important effect on maritime operations as well as on naval operations. A ship moving from an area which has a density value of 1.00500 into an area with a density of 1.00400 will be "tons heavy" to the extent of 1/1000 of her surface displacement. If the water density increases by one unit, the ship will be "tons light" by the same amount. A ship of 20,000 tons displacement which passes from an open sea area where the density is 1.02500 to the mouth of the Gulf of Finland where the density is 1.00500 in May would be "tons heavy" to the amount of 20/1,000 of her displacement, or 400 tons. She would therefore increase her draft by the number of inches obtained by dividing 400 by her "tons per inch immersion" figure, if we assume her sides to be nearly vertical just above the water line. Thus

$$\begin{aligned} \text{tons heavy} &= \frac{(D_1 - D_2)}{1,000} \times \text{surface displacement,} \\ \text{draft increase} &= \frac{\frac{(D_1 - D_2)}{1,000} \times \text{surface displacement}}{\text{tons per inch immersion}} \end{aligned}$$

where $(D_1 - D_2)$ is the difference between the density of sea water and the density of the water in the area into which the ship is moving.

Sea temperature.—Very few temperature readings have been recorded during February, when both gulfs are normally icebound. However, in the ice-free areas surface temperatures during this month are about 32° F. By May most of the ice disappears and mean surface temperatures range from 42° F. in the Gulf of Finland to 36° F. at the head of the Gulf of Bothnia (fig. 8). As shown in figures 9 and 10, surface temperatures increase with the advance of summer. By

November surface temperatures in the Gulf of Finland are generally the same as in May, while in the Gulf of Bothnia surface temperatures are slightly higher than those in May.

Salinity.—Figure 11 represents the mean annual surface salinity in parts per thousand. Salinity values remain relatively constant throughout the year. Slight variations are due mainly to fresh-water runoff, melting ice, and summer evaporation.

Density.—Density values (value 02.00 represents a density of 1.00200) as shown in figures 12, 13, and 14. During the month of May these values range from 1.00500 in the Baltic to 1.00100 at the head of the Gulf of Finland. With the increasing temperatures of summer, density values tend to decrease, especially in the Gulf of Finland, and with cooling in November they again increase.

BATHYMETRY

1-39 General remarks.—During the glacial era this entire area was subjected to a tremendous ice load. Pauses in the retreat of the ice left huge deposits of sediments which are now represented by the shoal areas between Åland Islands and Finland and the sill between the north and south basins of the Gulf of Bothnia (fig. 15). When the ice melted the great weight was removed from the earth's crust while more sediments were deposited. Thus, a general uplift of the land took place, restricting the water to smaller basins and leaving coasts dotted with numerous reefs and rocky islands. The general uplift of the land is still continuing at the rate of 1 cm. a year.

Gulf of Finland.—The Gulf of Finland has an irregular bottom with depths rarely exceeding 60 fathoms. The 20-fathom curve lies about 10 miles off the southern coast of Finland and is very irregular. Eastward of

28° E. the general depths are less than 20 fathoms, shoaling rapidly close to shore.

Åland Islands.—Eastward of the islands the general depths do not exceed 20 fathoms, except slightly to the northeastward. Between these islands and the Swedish coast there is a deep basin (Åland Deep), which reaches a depth of 157 fathoms.

Gulf of Bothnia.—This gulf is divided into a northern basin (Bottenviken) and a southern basin (Bottenhavet). They are separated by a shallow sill less than 20 fathoms deep. In the southern basin the 20-fathom curve lies about 10 miles off the Finnish coast and about 5 miles off the Swedish coast. In the center depths exceed 50 fathoms. This deep area broadens northward, and depths of over 100 fathoms are found near 63° N., 19° E.

The northern basin is shoaler than the southern. Rocks and islands are numerous toward the northern and shoaler portion of the basin. There are four small areas, all nearer to Sweden than to Finland, where depths exceed 50 fathoms.

BOTTOM SEDIMENTS

1-40 General remarks.—Near shore and in the shoaler areas the bottom grades from firm sand to stone and rock (fig. 16). Toward the deeper sections the bottom is usually soft mud-and-sand grading into mud. These sediments are largely glacial in origin, especially the stone and sand.

Gulf of Finland.—Sediments in the eastern part of the gulf are varied, consisting of large patches of mud, mud-and-sand, and rock. Outside Leningrad the bottom is mostly sand, with numerous rocky islands. Off the northern shore the bottom is rock with mud patches. The central part, floored with sand with rocky patches, becomes muddier toward the mouth. Sediments off the southern shore

are firm eastward of 26° E., becoming soft westward of that longitude. Near the Gulf of Riga these sediments have numerous rock patches.

Åland Islands.—From here eastward toward the Finnish coast there are numerous rocky islands. The bottom is rock and stone with small patches of sand-and-mud. Westward toward the Swedish coast the bottom is mud except for patches of stone and sand.

Gulf of Bothnia.—The southern basin (Bottenhavet) is mostly muddy, with a large rocky area lying northward of 61°15' N. The approach to the Swedish coast is floored with rock, but alongshore the bottom is mud or mud-and-sand. The Finnish coast is mostly rocky, with mud from 61° to 62° N.

The narrow, shallow entrance of the northern basin (Bottenviken) is floored by sand with small patches of other sediment. The sand extends northward in a widening belt along the coast of Finland. The bottom off Sweden is hard and stony except for a mud area off Pitholm and a sand area southward of Sandön. Between the sand off Finland and the stone off Sweden the bottom is soft except for a narrow belt of sand in the north central part. The bottom off the northern shore is mostly hard.

SEA AND SWELL

1-41 In the Gulf of Finland, seas are predominantly low during the summer months. Frequent storms in winter increase greatly the incidence of rough seas. Spring and autumn months have conditions similar to those of winter. Even during these stormy months the head of the gulf is relatively calm. The prevailing seas come from the west during the summer, and vary from the northwest to the south during the rest of the year.

Moderate swell is common in the summer. Although not reported, moderate and high

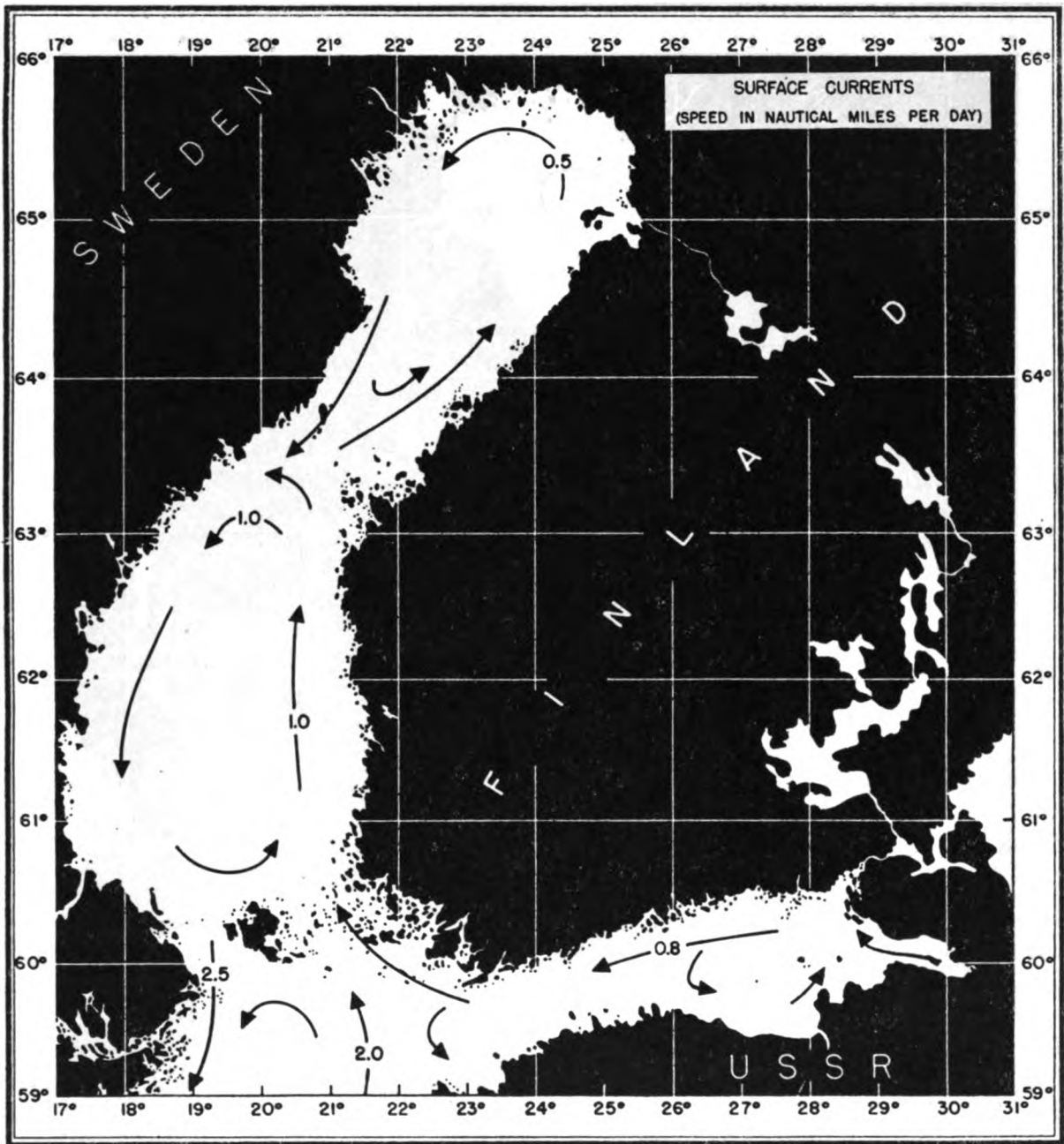


Figure 7

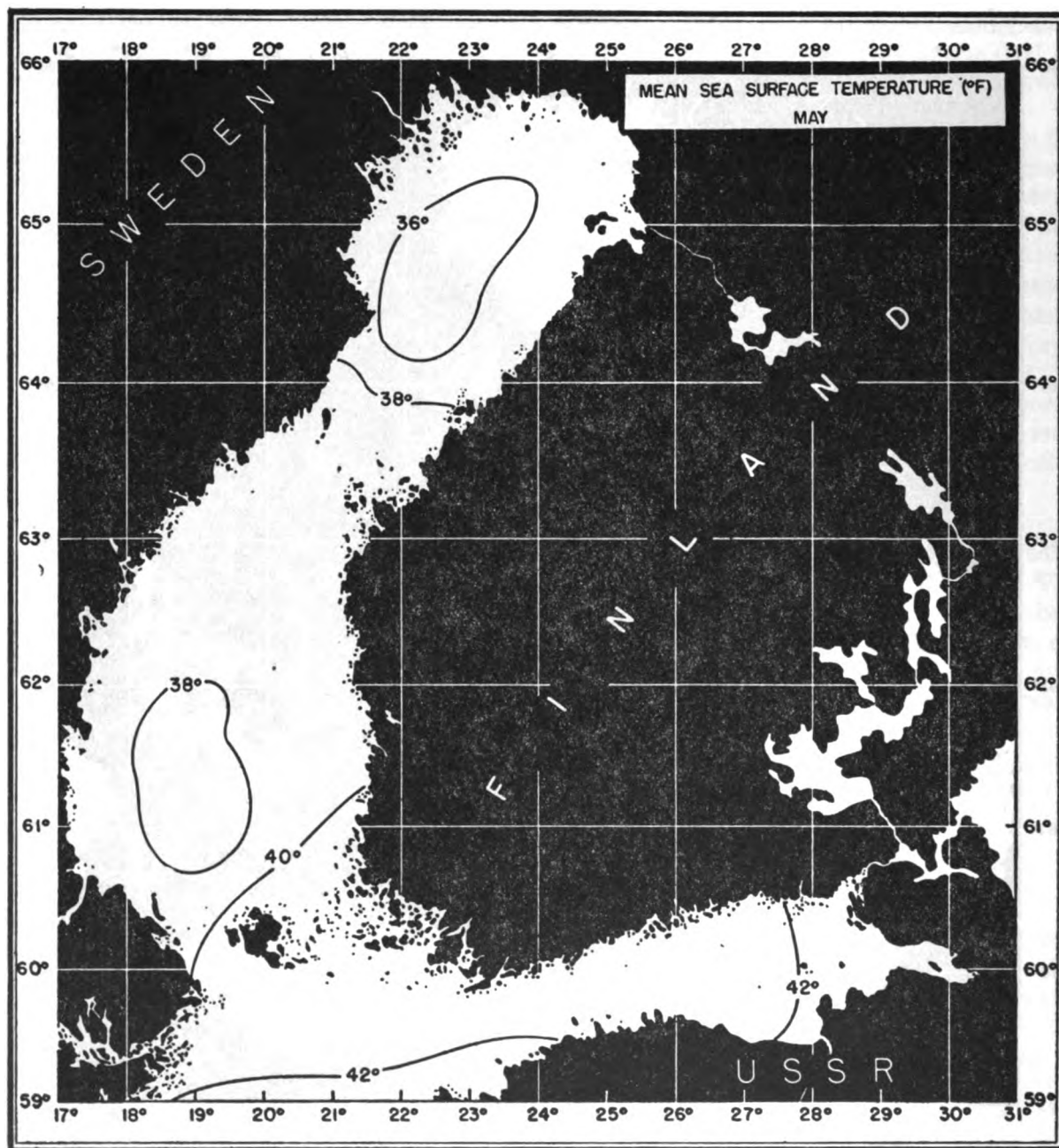


Figure 8

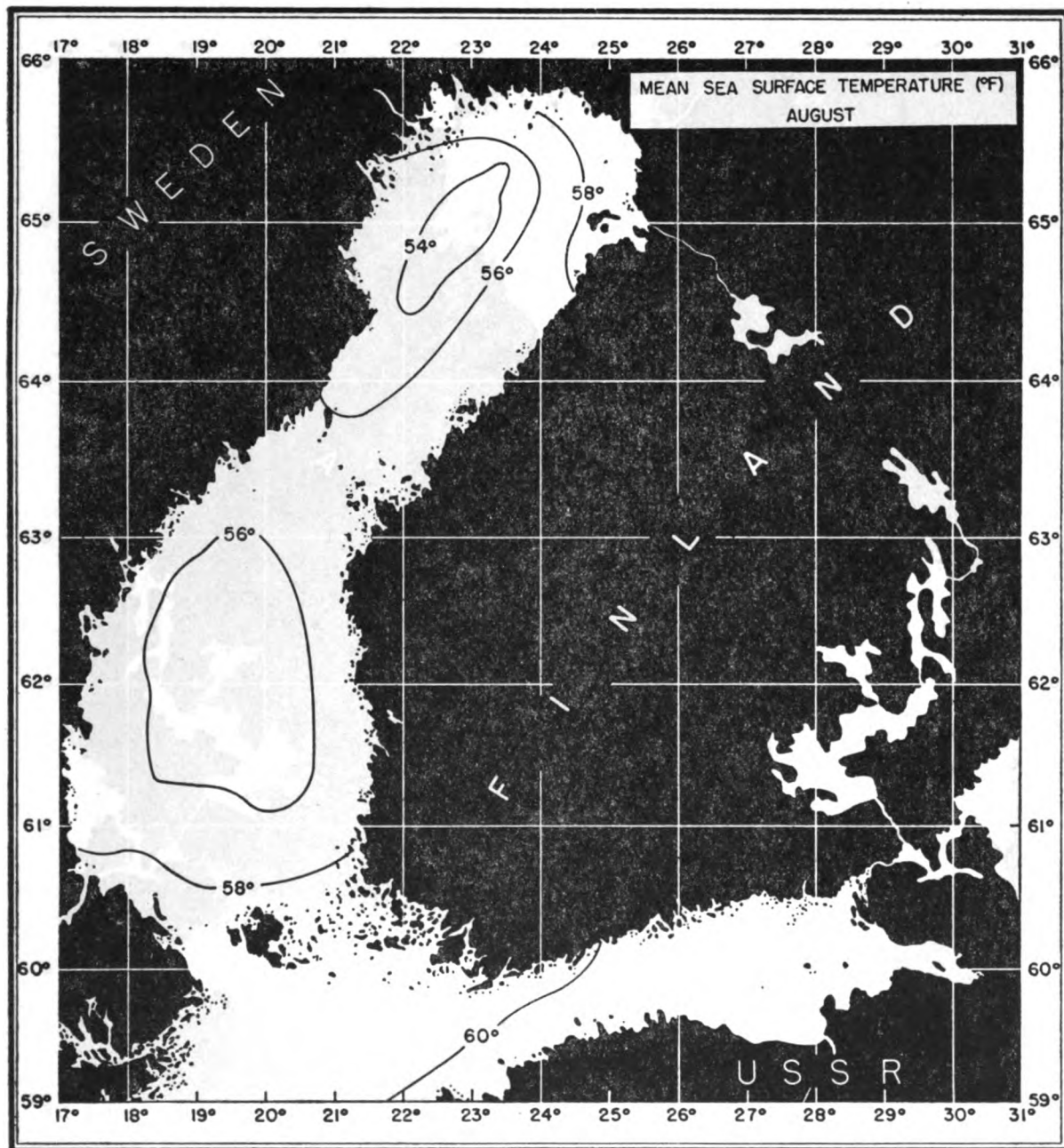


Figure 9

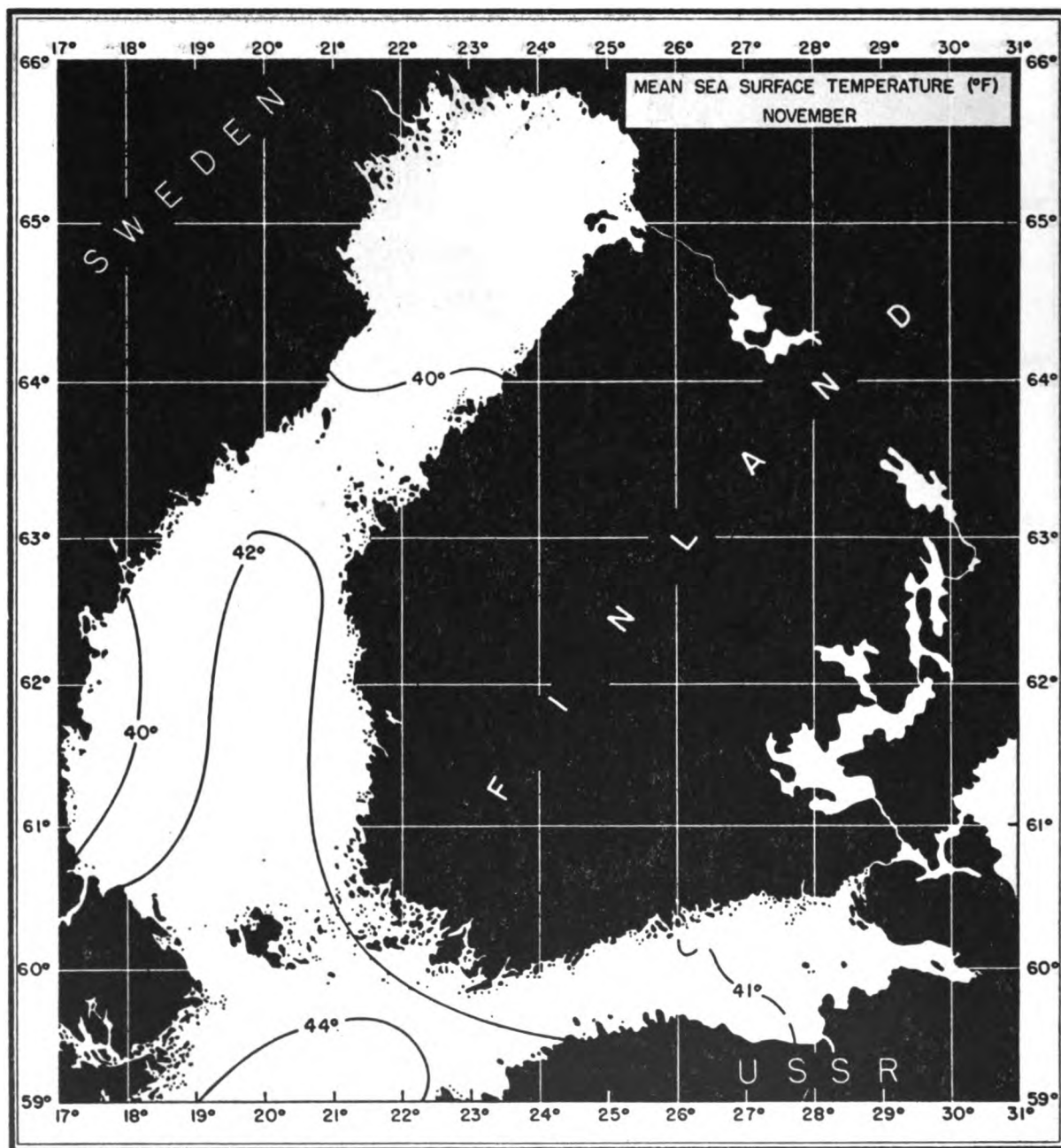


Figure 10

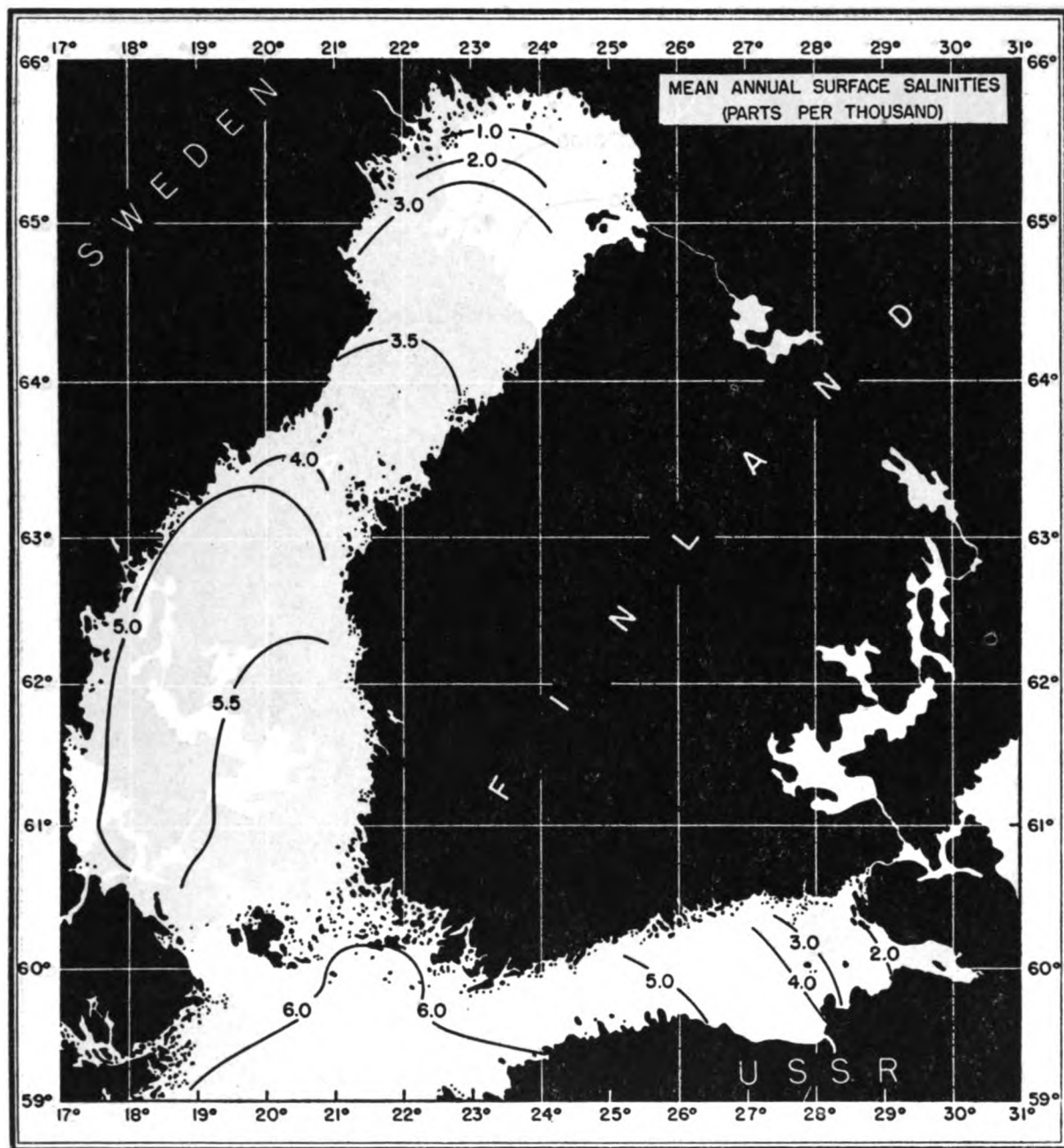


Figure 11

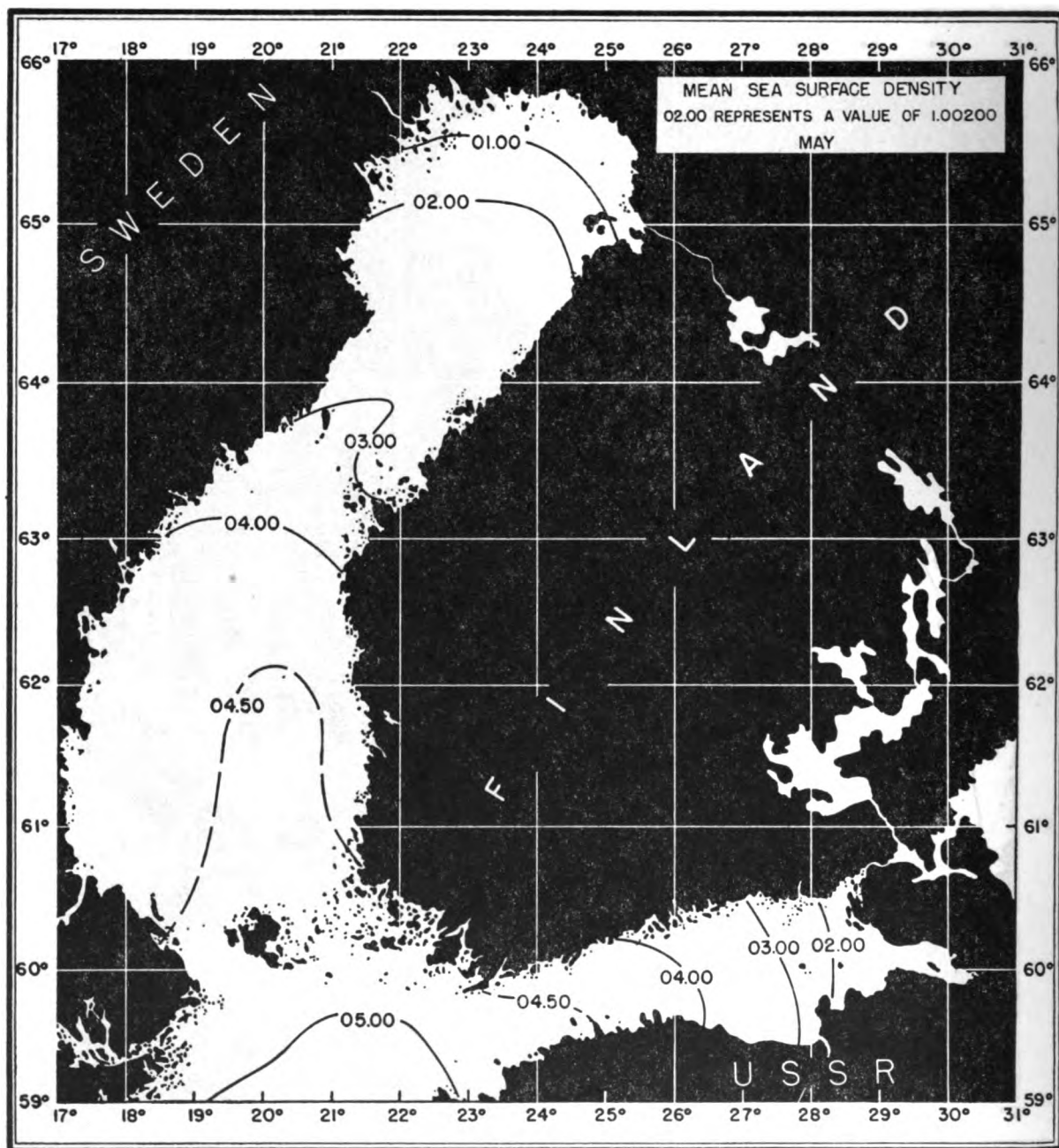


Figure 12

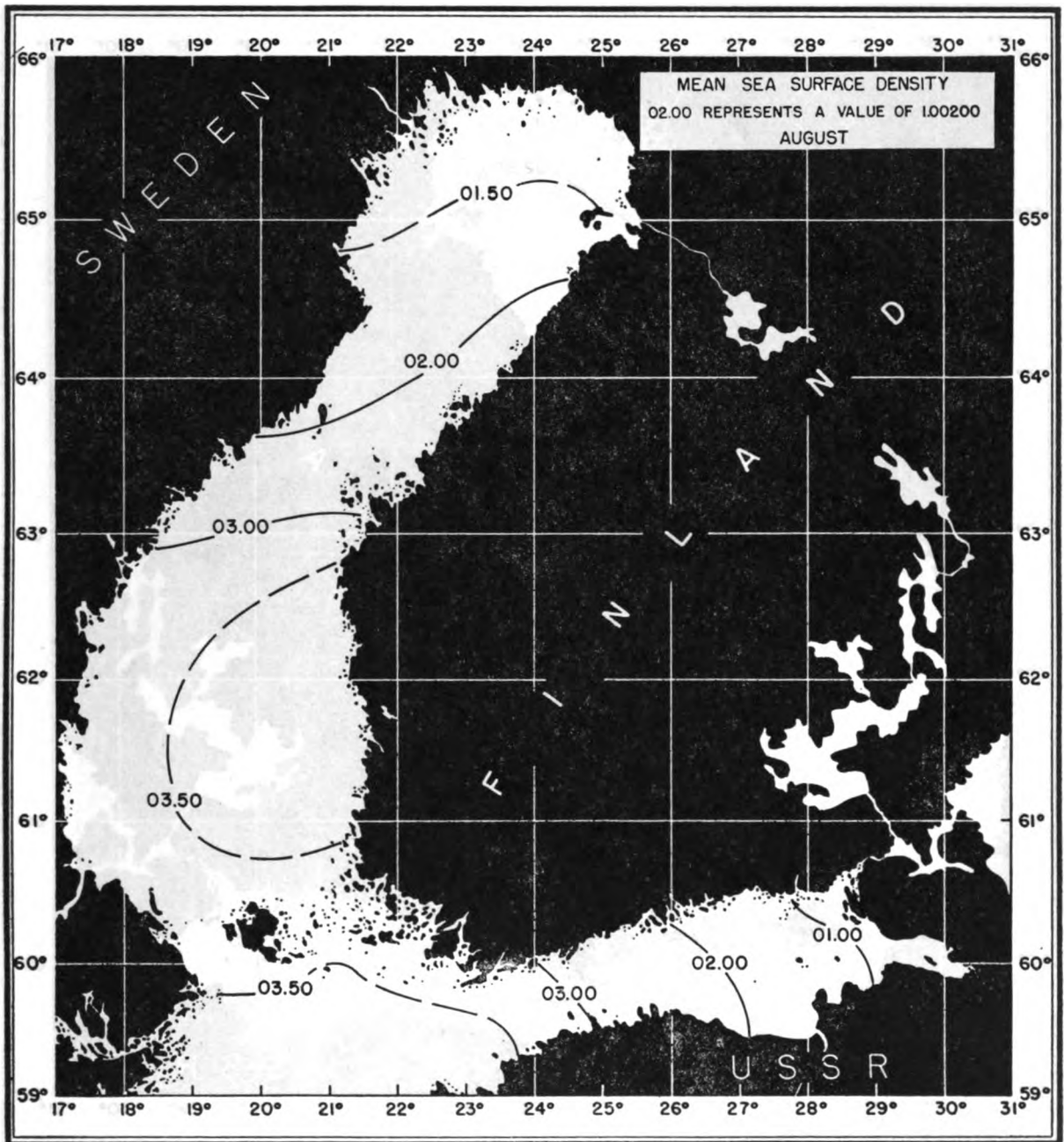


Figure 13

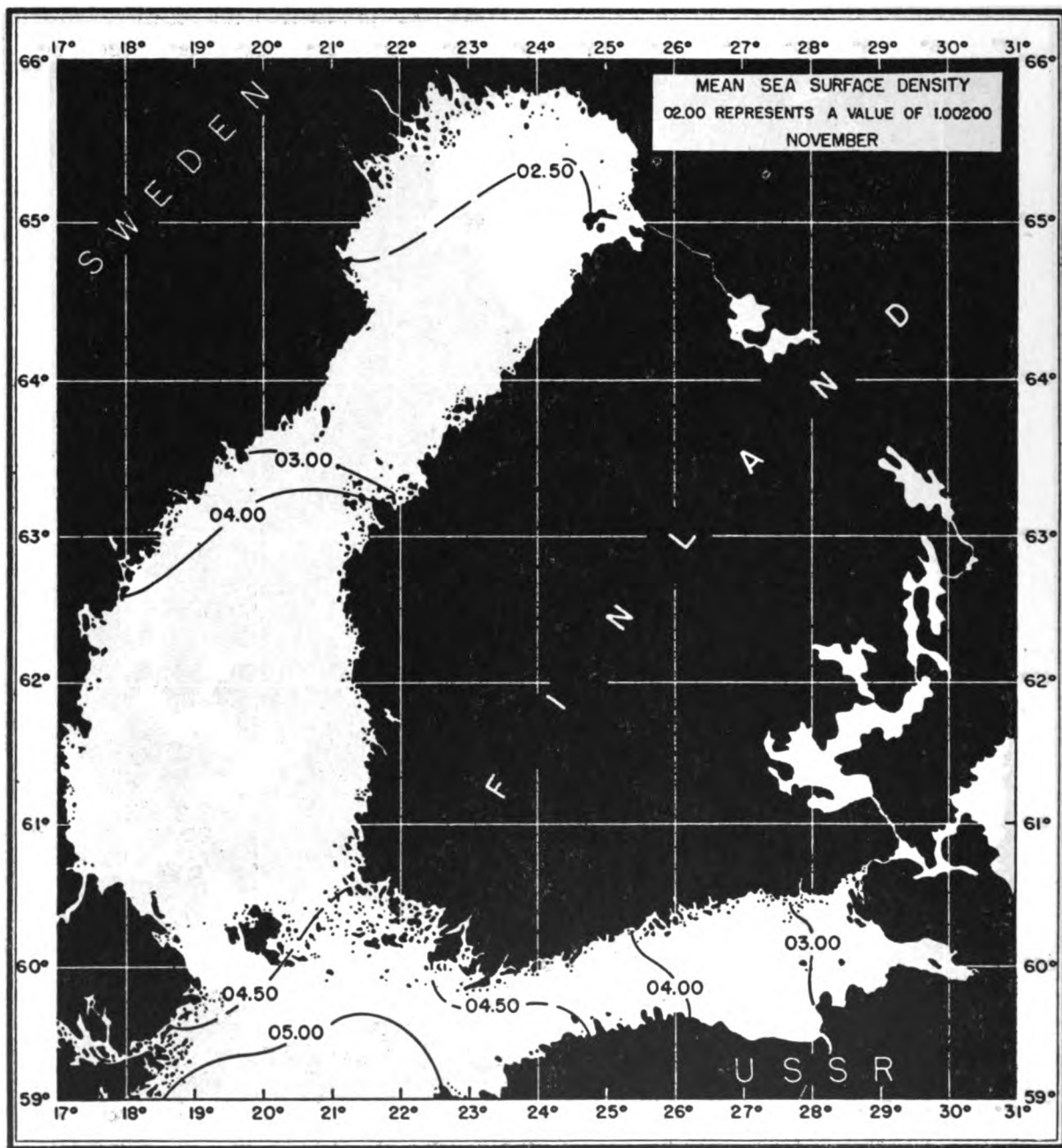


Figure 14

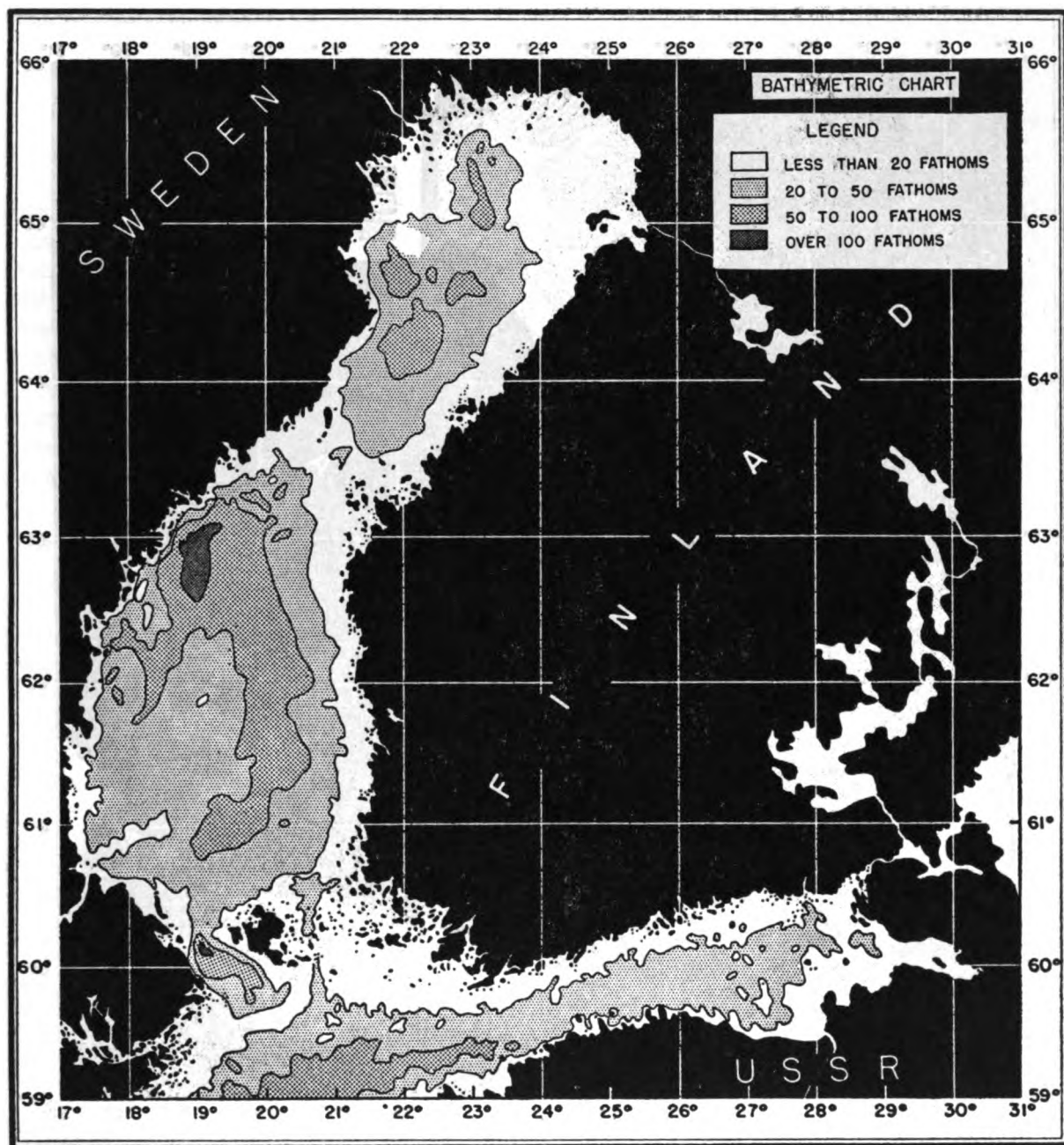


Figure 15

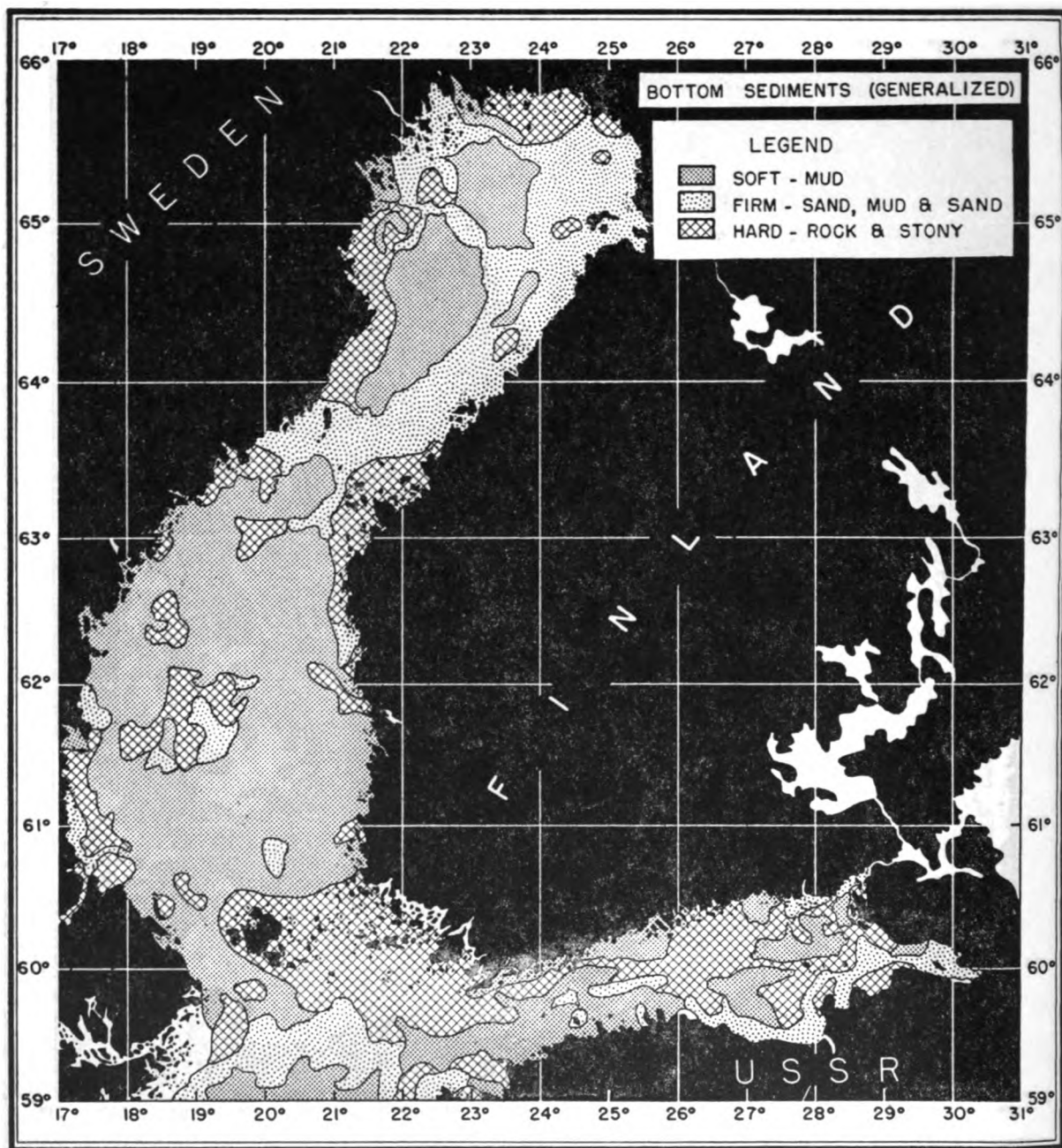


Figure 16

swell might be assumed to prevail during the stormier months.

In the Gulf of Bothnia during the spring and summer months the predominant low seas originate in the northeast and southwest quadrants. In the autumn months, seas originate mainly in the southwest quadrant, but from a more southerly direction than in summer. During the winter, although some seas may develop, they increase gradually with the progress of ice formation. The highest percentage of rough seas occurs during the autumn months.

Swell is low to moderate for the greater part of the time. However, extremely heavy swell declines from 19 percent of the time in summer to 13 percent in autumn.

CLIMATOLOGY¹

PRESSURE AND WINDS

1-42 On an average, during most of the year, the pressure over this area is highest in the south and lowest in the north. Thus the prevailing winds are westerly throughout the year. The predominant southwest winds transport mild, moist air from the Atlantic and produce semi-marine climate, especially over southern Finland.

In all seasons, however, low pressure centers which originate over the North Atlantic move eastward across or to the north of the area and control the winds and weather to such an extent that average conditions are seldom realized. These lows, infinitely variable in intensity, frontal structure, path and rate of movement, interspersed with anticyclones and intermediate pressure distributions, combine to give the air flow and weather a high degree of variability.

¹ Prepared by the U. S. Weather Bureau from compilations of ship and coastal station weather observations on file in the Climatological Services Division, and from other sources.

When a low pressure area is approaching, at first high clouds appear which may give rise to halos; later lower clouds appear and gradually the sky becomes overcast with low cloud; finally rain begins to fall and usually continues for some time, causing some restriction to the visibility. If the low is traveling to the north of the observer, and traveling in an easterly or southeasterly direction, the winds in front of the depression are southeasterly or southerly. They veer to southwest and strengthen, frequently with a rise in temperature and a diminution of rain. Finally they veer to northwest with rising pressure, falling temperature and much improved visibility. The shift to northwest may occur suddenly and be accompanied by a squall and a heavy shower of rain, hail, or snow. As the low passes, the wind gradually decreases in strength; showers may be experienced, but after a time they cease and the sky clears. Should the wind back again, another low is usually approaching. If a low center is passing to the south of the observer and travelling in an easterly direction, the wind backs to east with a falling barometer and rain or snow, and then through northeast to north with rising temperature. The winds are not usually as strong on the north side of a low as they are on the south side.

In the winter, pressure is, on the average, high to the southeast and low to the northwest. The winds are mainly from directions between southeast and west. Migratory low pressure areas, however, are very frequent and bring changes of wind direction. During this season these lows are large, sometimes thousands of miles in diameter, and deep; they cause gales and strong winds over large areas. Gales from northeast and southwest are most frequent and last longest. At times, especially in the latter part of the winter, the winter anticyclone to the southeast ex-

tends northward and westward. Pressure is then high over the Baltic and lows have little influence. The winds are light southeasterly or easterly with calms, and the weather is very cold. Frequency of winds reaching force 8 or over in winter is 6 to 8 percent south of latitude 60° but less than that in the Gulf of Bothnia. Winds of force 4 to 7 prevail from 50 to 60 percent of the time.

During the spring the average pressure is decreasing to the southeast and increasing slightly to the northwest; the gradient is rather indefinite. Prevailing winds are then more variable than in winter. In some years winds from between north and southeast are frequent. They sometimes blow for considerable periods, especially in the northern part of the region. In May these winds bring clear skies with cool weather. Southwest and west winds still prevail over the northern part of the Baltic Sea and the Gulf of Finland. Over the southern part of the Gulf of Bothnia north winds prevail; south winds remain frequent, but there is considerable decrease in southwest and west winds. There are no winds of force 8 or over and force 4 to 7 winds decrease to 28 percent from winter. North winds prevail over the middle and northern part of the Gulf of Bothnia, but south and southwest winds are almost as frequent. Northeast and south winds are next in frequency. Winds of force 8 or over occur one percent of the time over the northern portion. Winds of force 4 to 7 occur 33 percent of the time over the middle portion and 25 percent over the northern portion.

Until middle summer, mean pressure distribution remains indeterminate. In August a very weak center of low pressure appears over northern Finland. The Azores anticyclone extends eastward, sometimes over Europe. There is, on the average, a decrease of pressure from south to north, giving a

gradient for westerly winds. The winds in summer are, however, very variable; northwesterly and northerly winds are frequent, especially in the north, and land and sea breezes are felt during settled weather. In summer, lows travelling across or near the area are much less frequent and gales associated with them are more local. Southwest winds prevail over the extreme southern portion of the area during this season. No winds of force 8 or over occur. Force 4 to 7 winds occur about 35 percent of the time. Over the southern part of the Gulf of Bothnia north and south winds prevail and are almost equal in frequency, but in the middle and northern parts of the gulf south winds prevail. Southwest winds decrease over the southern part, but are frequent over the middle and northern portions. Northeast winds are also frequent over the middle and northern portions. No winds of force 8 or over occur over the Gulf of Bothnia in summer, but force 4 to 7 winds occur about 34 percent of the time.

The autumn pressure gradient is about the same as that of winter, from south-southeast to northwest, but not as strong. Air flow is distinctly from southwest, south, and west over the entire area, with very few departures; these include southeasterly winds on the east side of the northern part of the Gulf of Bothnia. Cyclonic activity increases during the season and brings its attending shifting winds. Gales increase in frequency. November is the month of maximum frequency at a few stations in southern Finland. The frequency of winds of force 8 or higher is between 4 and 5 percent in the southern part of the area and 2 and 3 percent over the Gulf of Bothnia. Winds of force 4 to 7 occur 54 percent of the time in the extreme southern portion of the area and about 51 percent of the time over the Gulf of Bothnia.

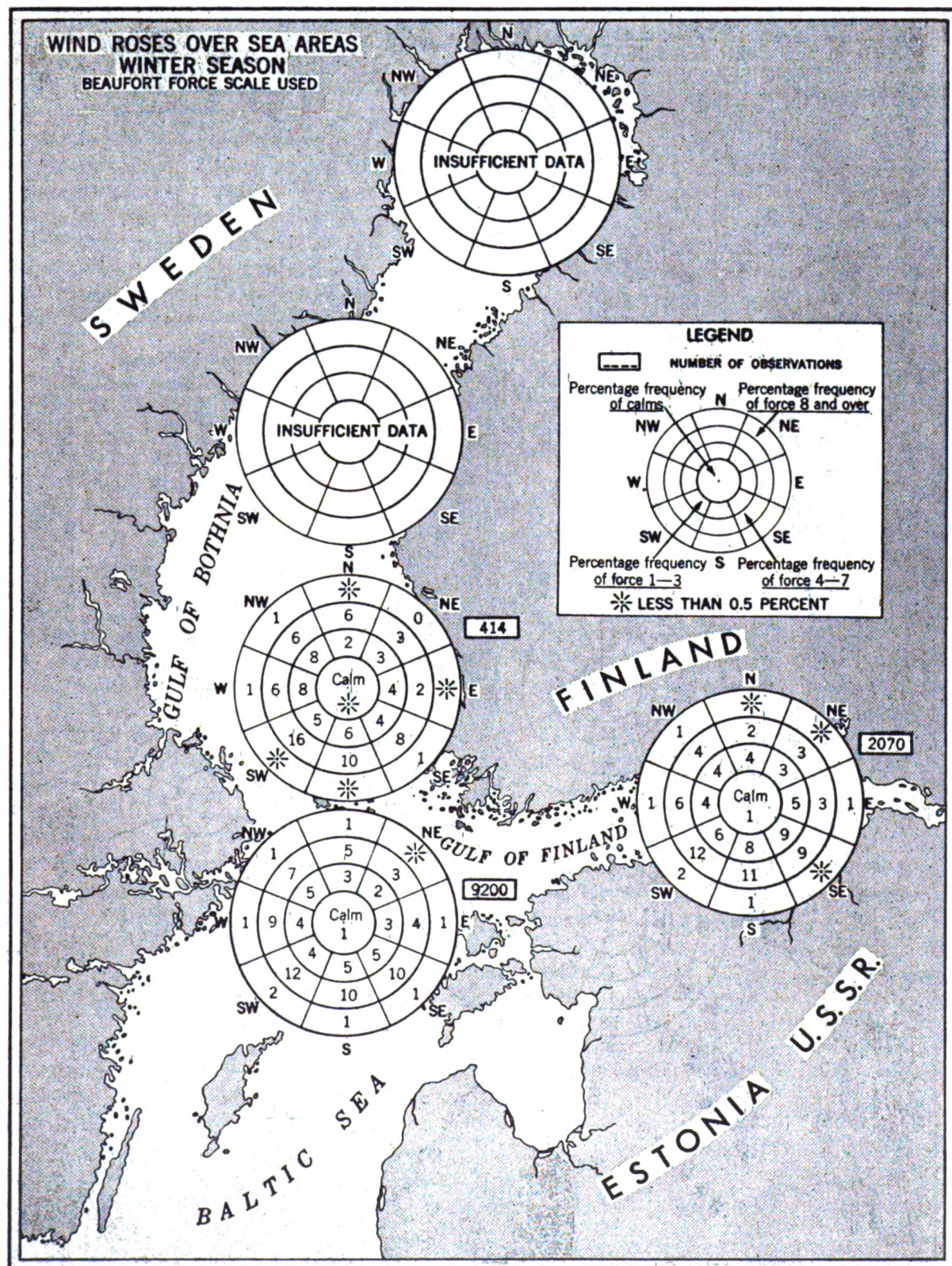
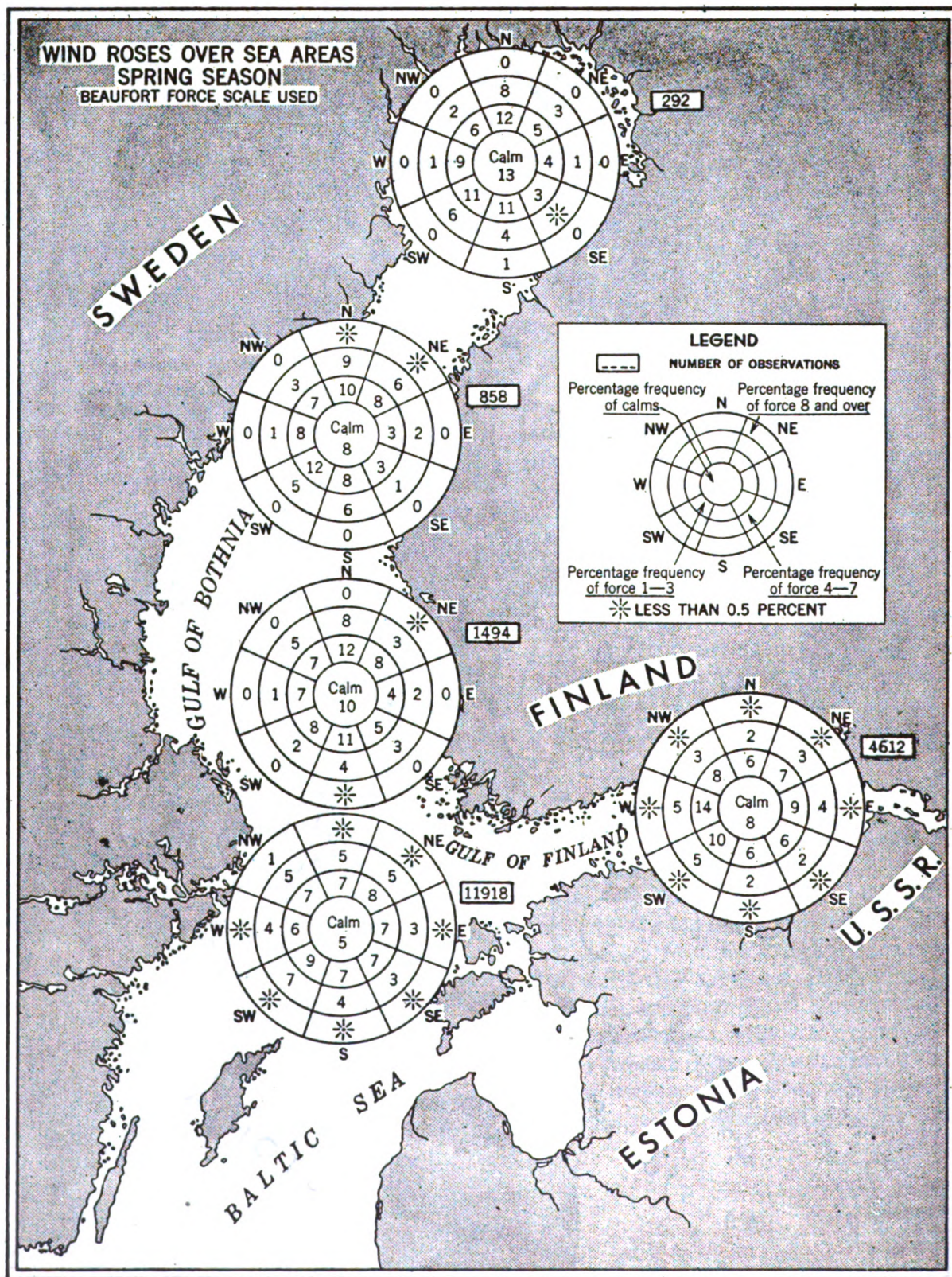


Figure 17

H. O. 143



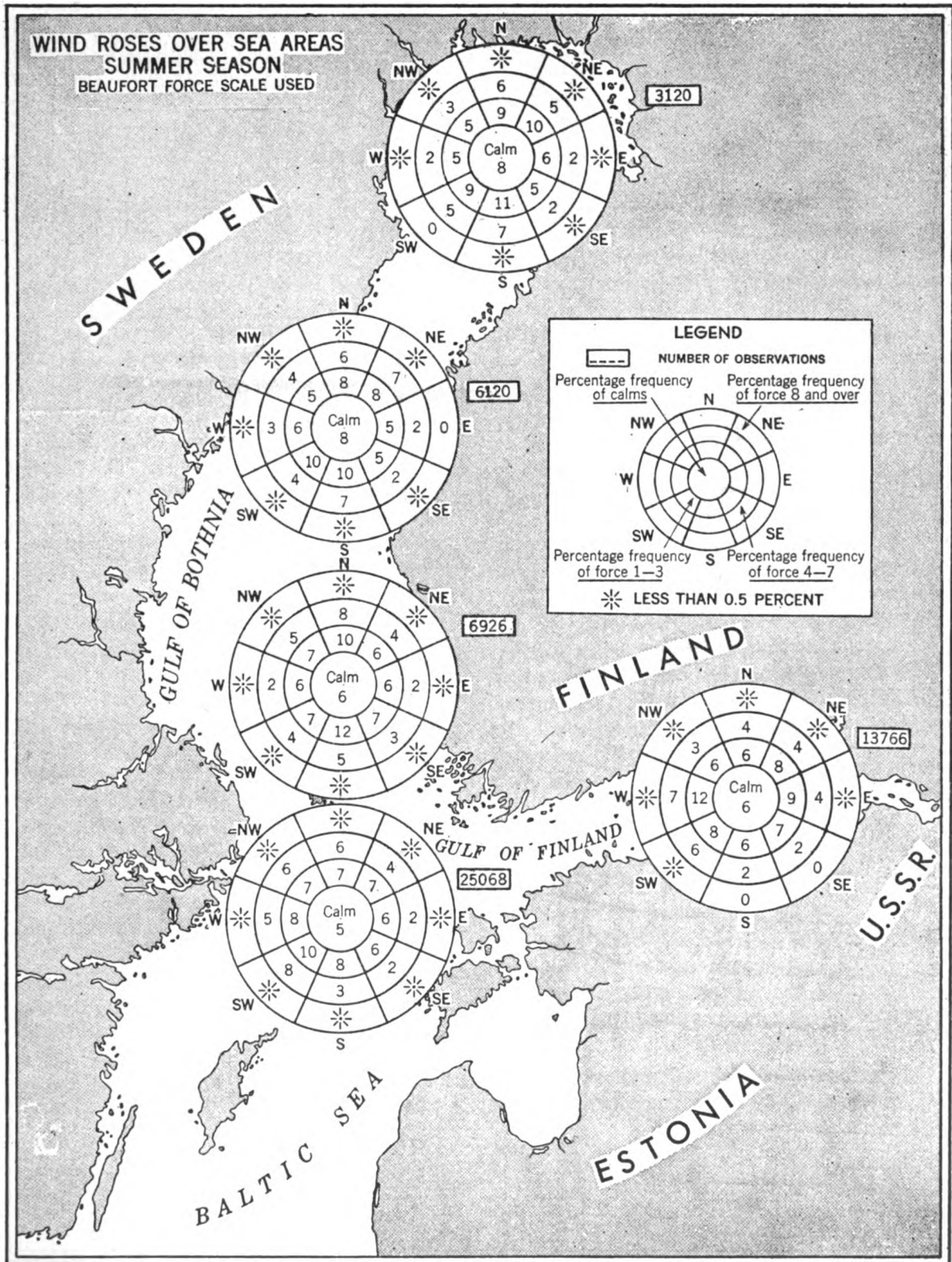
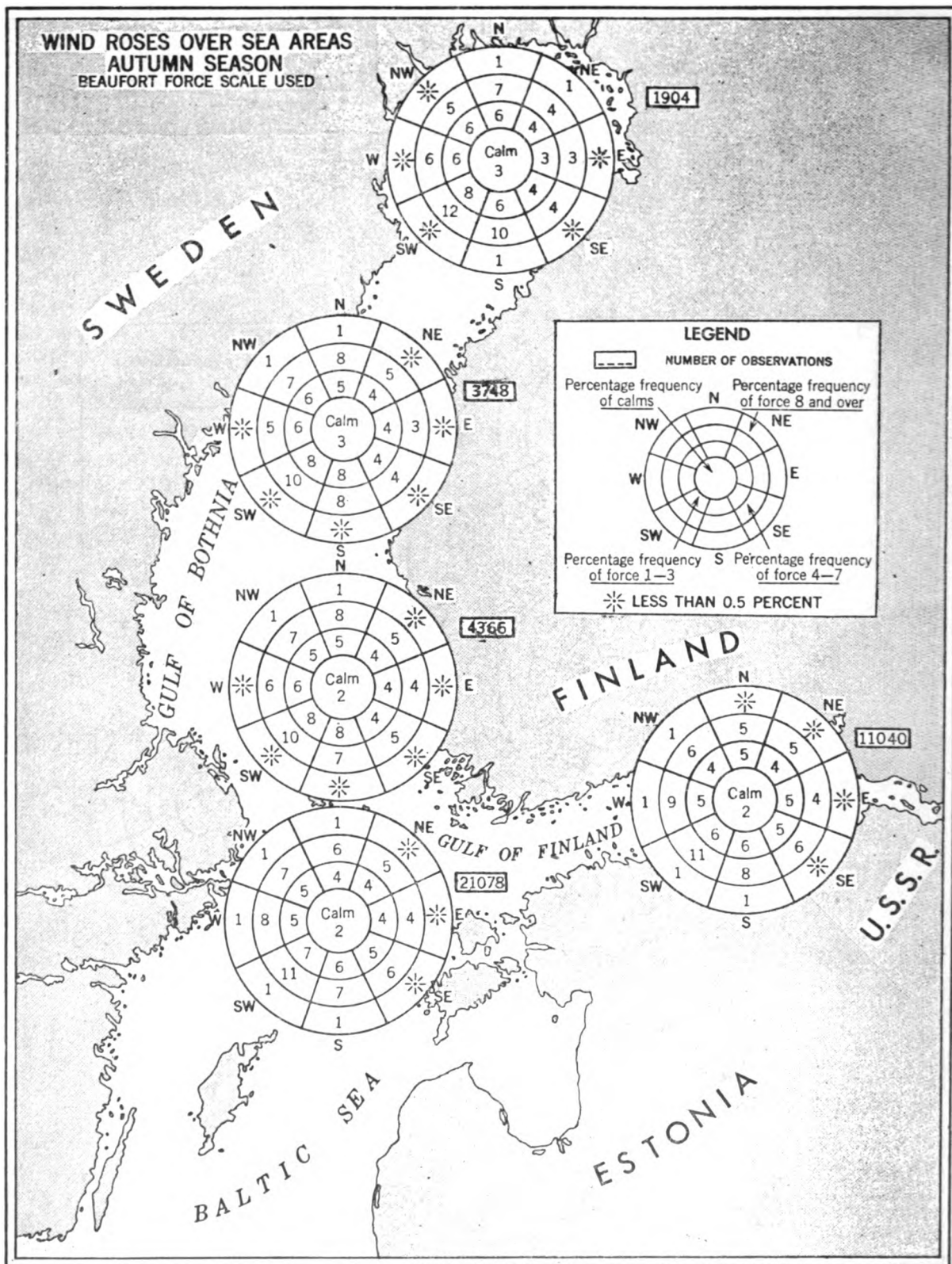


Figure 19

H. O. 143



Figures 17, 18, 19, and 20 present graphically the wind direction and force in the Gulf of Finland and the Gulf of Bothnia

TEMPERATURE

1-43 This region experiences cold winters, especially in the northern part. Nevertheless, at most coastal locations mean temperatures in winter are about 20° F. above the normal for the latitude. The oceanic influence is much weaker during the feeble circulation of summer, when temperatures over Finland are approximately normal for the latitude. There is a short period of fairly warm weather in the summer. The mean annual temperature for the region as a whole varies from a little over 40° along the shores of the Gulf of Finland to 33° at Tornio and Haparanda on the north shore of the Gulf of Bothnia. During the winter half of the year the temperature is continuously below the freezing point for a length of time which varies from one region to another. On the coast of Sweden from Gävle to Umeå there are about 60 to 80 days during the winter when the maximum temperature does not reach freezing point; from Umeå northward there are from 80 to 100 such days. On the shores of the Gulf of Finland and in the Åland Islands the mean temperature is below freezing point from the end of November or early December until early April. The mean temperature is below freezing point in the southern part of the Gulf of Bothnia from the middle of November to the middle of April, and in the northern part from the end of October to the middle of April.

Very low minimum temperatures are reached at times. The average minimum temperatures are below zero at most of the ports in January and February, and at some of the ports in December and March as well. Winds from the northeast and east bring intense cold in winter.

Mean temperatures rise rapidly in April, May, and June. July is usually the warmest month, when the mean temperature is from 63° to 64° along the southern shore of the Gulf of Finland, from 61° to 63° along the northern shore, and from 57° to 60° along the shores of the Gulf of Bothnia. Warm weather extends from the end of May until the middle of September in the south, and from early June to early September in the north. Hot weather is sometimes experienced. On the average, daily maximum temperature reaches about 80° to 85°, but temperatures of 90° and over have been recorded at many of the ports. Turku, on the southwest coast of Finland, has recorded 97°. Along the Swedish coast there are about ten days a year when the maximum temperature exceeds 77°.

Over the sea in winter the temperature is not quite so low as on the shore. In the Gulf of Finland the mean temperature is near or below the freezing point from the middle of December to the beginning of April in the west, and from late November to early April in the east. In the northern part of the Gulf of Bothnia the mean temperature is below the freezing point from late November to the second half of April. During July and August the mean air temperature over the sea reaches from 60° to 62° in the Gulf of Finland, and from 53° to 60° in the Gulf of Bothnia.

PRECIPITATION

1-44 The amount of precipitation varies considerably from one year to another, being dependent on the depressions which affect the region. The average annual amounts are about 25 inches on the northern shore of the Gulf of Finland, 22 inches southward from Vaasa on the Gulf of Bothnia, and on the Swedish shore, from 19 to 23 inches. From a

quarter to one-third of these amounts fall as snow. Snow lies on the ground about 4 months in the south and about 6 months in the north.

The greatest monthly amount of precipitation occurs from July to October. In July and August monthly rainfall up to 6 and 7 inches have occurred along the northern shore of the Gulf of Finland and over the Åland Island respectively. Along the Finnish coast of the Gulf of Bothnia up to 7 inches have occurred, while along the Swedish coast 8 to 9 inches or more have occurred during August and September.

Rain or snow falls on from about 140 to 180 days during the year. The autumn and early winter generally have the largest number of days (17 to 18), and the spring months the smallest number (from 7 to 11).

Very heavy falls of rain are not frequent; the greatest amount recorded in 24 hours is 4.67 inches at Härnösand.

CLOUDINESS

1-45 Mean cloudiness is moderately high at coastal locations throughout the year. It is greatest in winter, when the average amount is from 7 to 8 tenths of the sky covered. In the summer the average amount is about 5 tenths. (See fig. 21.) On the coast of Sweden in winter, cloudiness on the average is greatest in the morning and least in the evening; in summer it is least at noon and greatest in the morning and evening. On the coast of Finland and in the Åland Islands in winter it is greatest at noon and least in the evening. This is due primarily to the daytime heating of the moist air over the warmer sea. In summer the percentage is about equal in the morning and at noon and least in the evening. The diurnal variation is not great, however, during the summer.

VISIBILITY

1-46 Bad visibility is most frequently caused by snow during the winter and by fog during the other seasons of the year. For the sea areas, seasonal frequencies for low visibility and fog are given in figures 22 and 23. In general, the maximum frequency of sea fog occurs in the spring, associated with the breaking up of ice. At coastal locations the spring maximum is not as pronounced due, in part, to the occurrence of typical radiation fog during other seasons. At Maarianhamina, in the Åland Islands, the largest number of foggy days occur in April, with an average of four. In February, March, May, and October there are, on the average, three foggy days per month. Table 7 gives the average number of days with fog in each month at some ports and lighthouses on the coasts of the Gulfs of Finland and Bothnia.

Fog is, on the whole, more frequent at night and in the early morning than at other times of the day. This diurnal variation is most marked in the summer; there is very little diurnal variation in winter.

In the Gulf of Finland about half of the fogs are of less than 10 hours duration; about a third last 18 hours or a little longer; and about a twelfth of them last 24 hours. At Eggegrund, however, about one-seventh of all the fogs last 24 hours.

Fog is most frequent with calms and light winds, although it has been known to occur with winds of force 4. In the Gulf of Finland, fog generally occurs with light easterly winds; in winter it is least likely with northerly winds and in summer with southeasterly winds. On the Swedish shore of the Gulf of Bothnia, fog occurs mostly with southerly winds in winter, and with winds between northeast and south in summer.

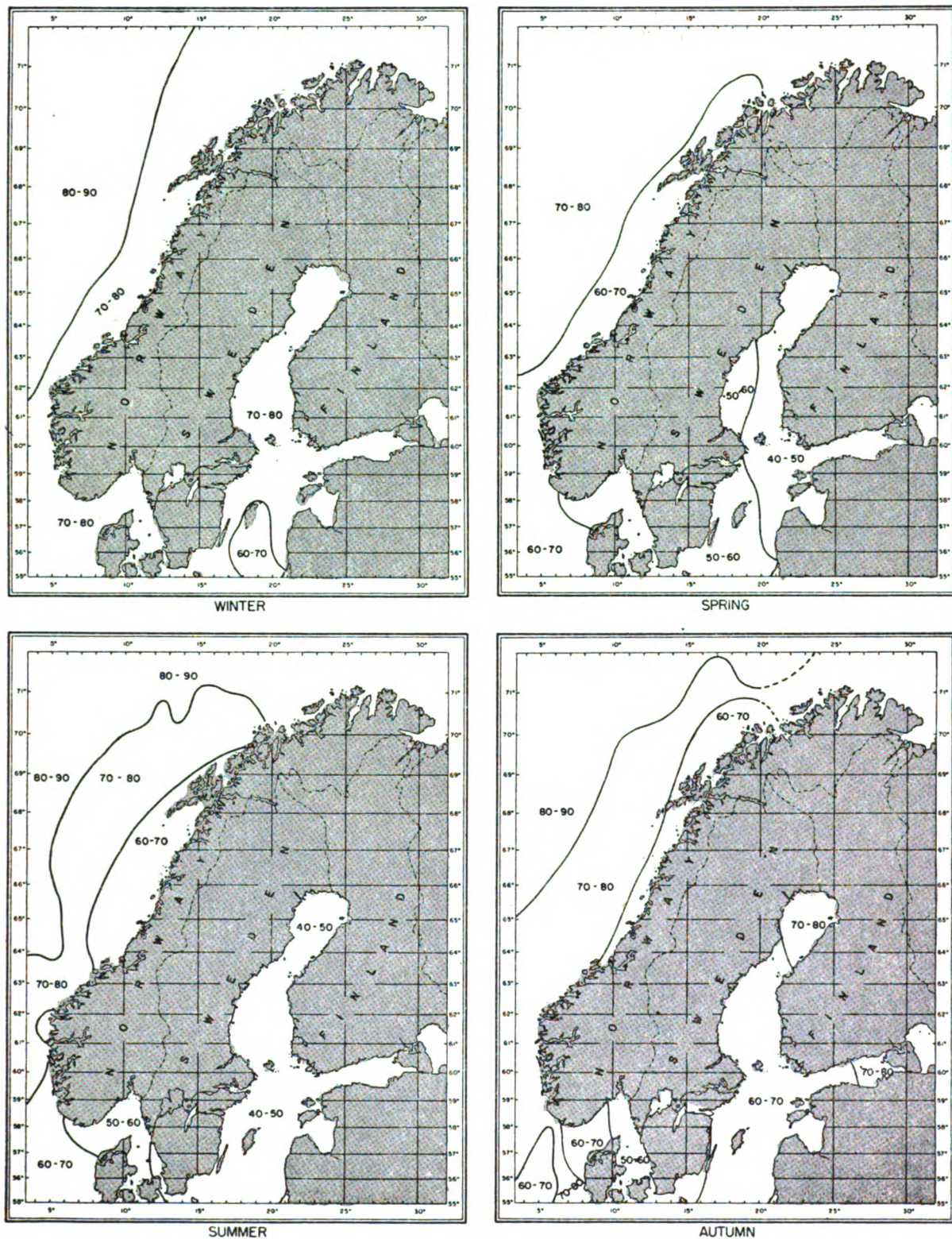


Figure 21.—Mean total cloud amount (%) over sea areas.

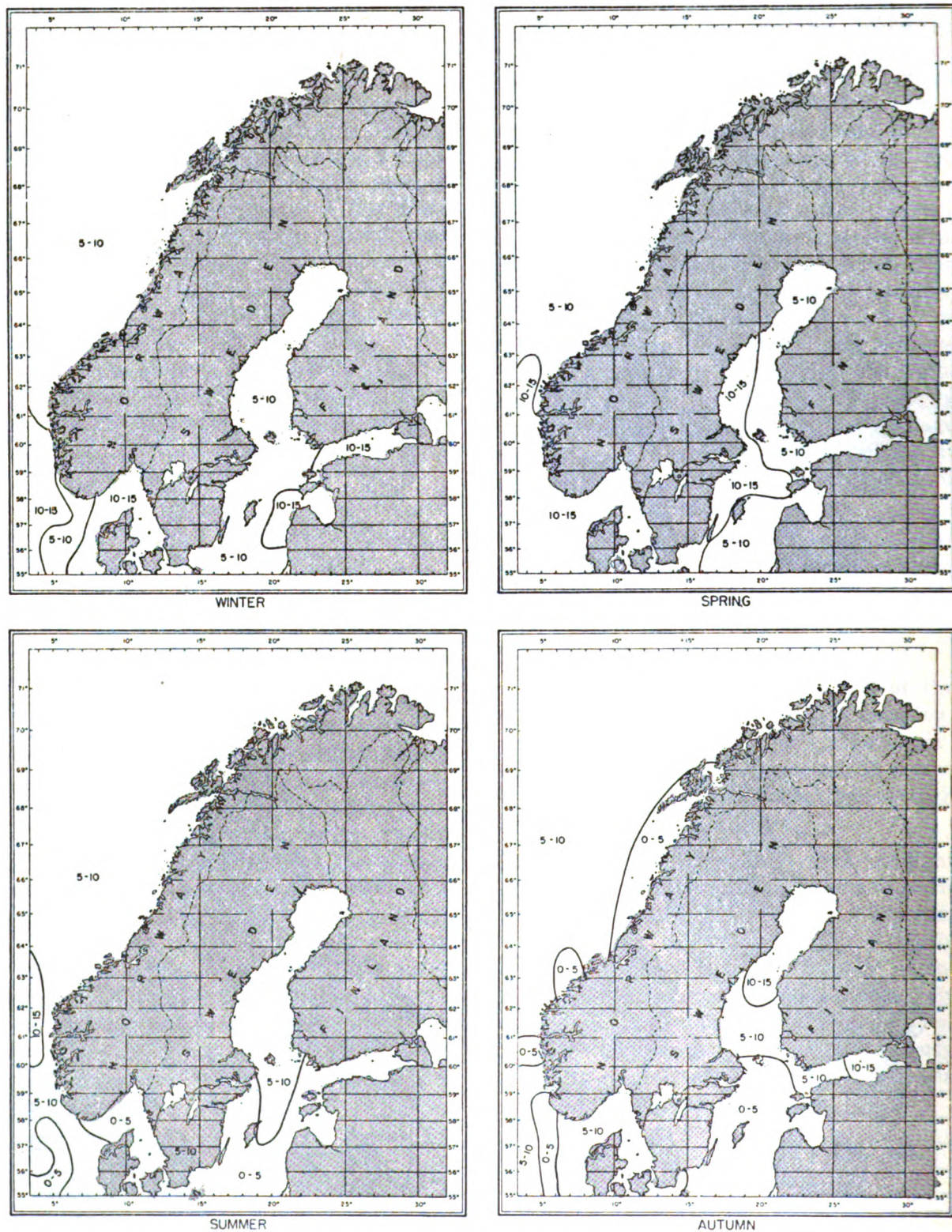


Figure 22.—Percentage of observations with visibility less than 2 miles, sea areas.

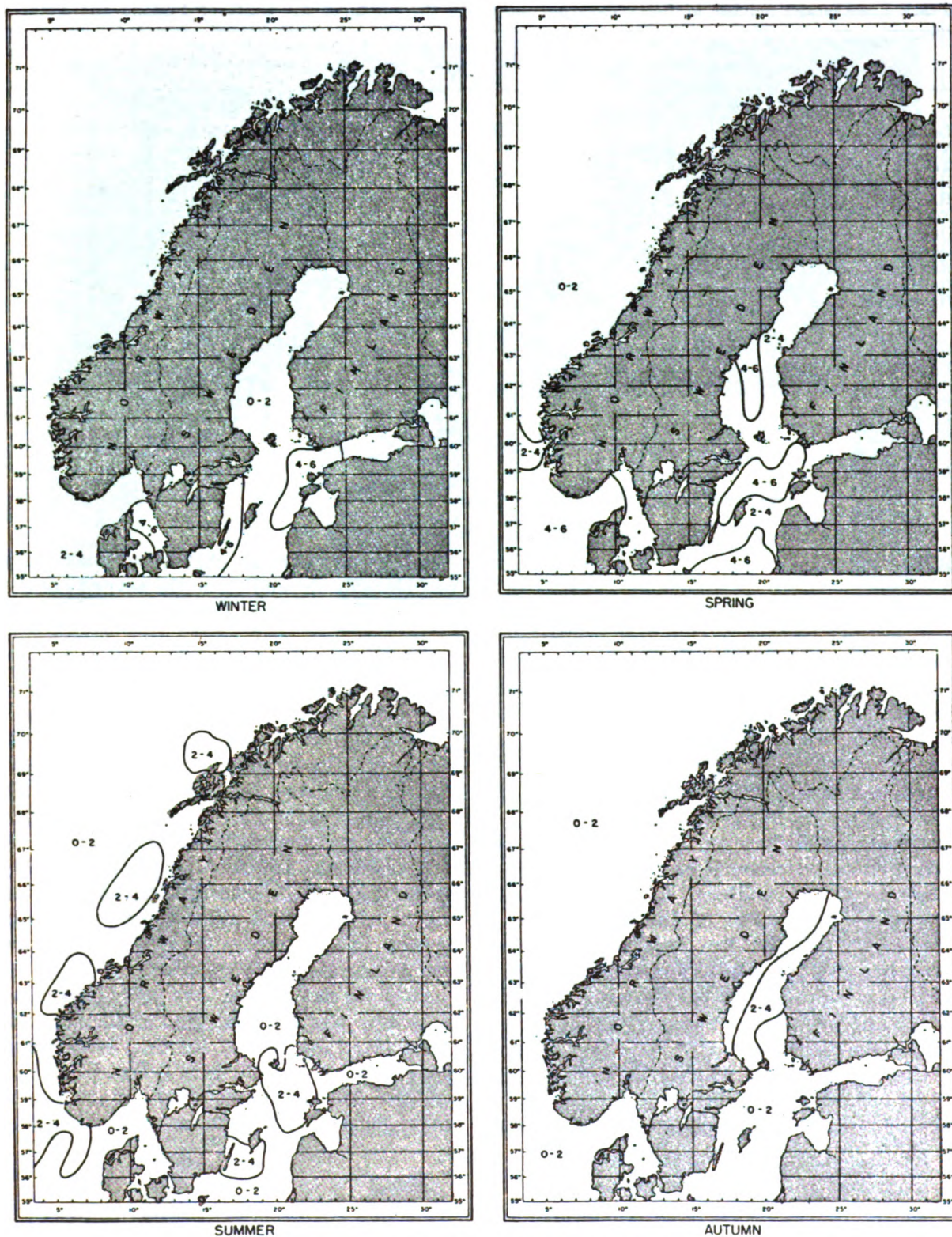


Figure 23.—Percentage of observations with fog, sea areas.

TABLE 7.—Average number of foggy days per month on the coasts of the Gulfs of Finland and Bothnia

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Years of record
<i>Ports</i>													
Leningrad.....	3	4	4	4	2	1	1	3	6	6	4	5	13
Vyborg.....	2	2	2	2	1	(¹)	(¹)	1	3	3	3	2	40
Tallinn.....	5	6	8	5	6	2	3	4	6	6	7	7	15
Helsinki.....	6	7	7	8	4	3	2	2	3	5	3	4	40
Hanko.....	2	3	4	5	4	2	1	1	2	2	1	2	40
Turku.....	3	3	2	2	1	1	1	1	3	3	3	2	40
Oulu.....	3	3	2	1	1	(¹)	(¹)	1	2	3	3	3	40
Gävle.....	1	1	2	2	1	1	1	1	2	3	2	2	50
Härnösand.....	2	2	3	4	3	2	2	3	4	5	3	3	50
Umeå.....	2	2	2	3	1	1	1	2	3	3	2	1	50
Haparanda.....	2	2	2	2	2	1	1	1	2	3	3	2	50
<i>Lighthouses</i>													
Understen.....	2	2	2	5	3	2	2	2	2	2	1	2	40
Esgegrund.....	3	2	2	4	3	3	4	2	3	2	3	3	25
Storjungfrun.....	1	1	2	4	3	2	2	2	2	2	2	1	40
Bramön.....	1	1	2	4	4	3	4	3	3	3	2	3	40
Lungö.....	2	2	3	5	3	2	3	2	3	4	2	2	20
Holmögdad.....	2	3	3	4	4	3	4	3	3	3	2	2	40
Stora Fjäderågg.....	1	2	2	4	4	4	4	2	3	2	2	2	25
Bjuröklubb.....	3	3	3	4	3	3	3	3	3	3	3	3	40

¹Less than 0.5 day.

ICE

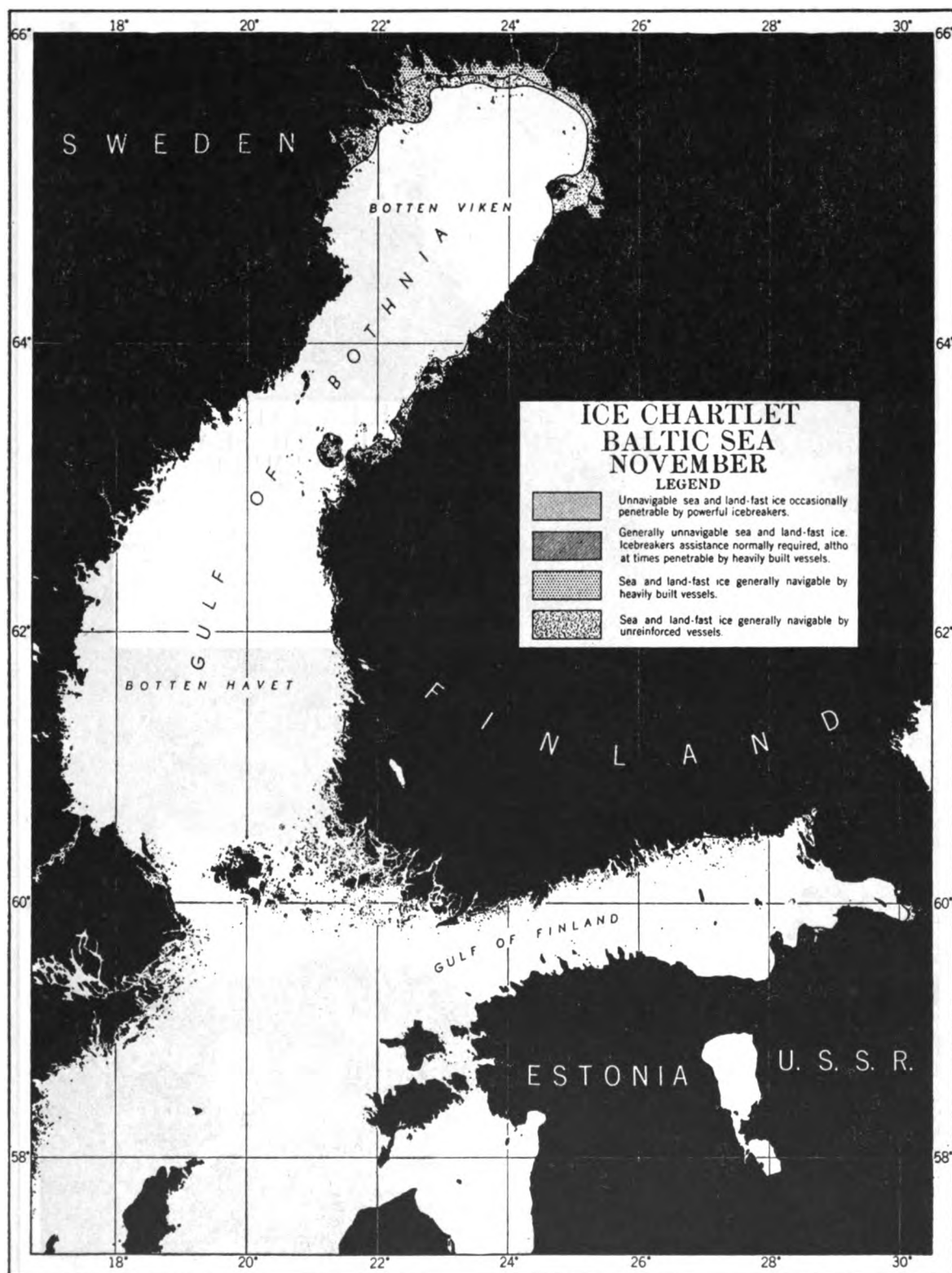
GENERAL REMARKS

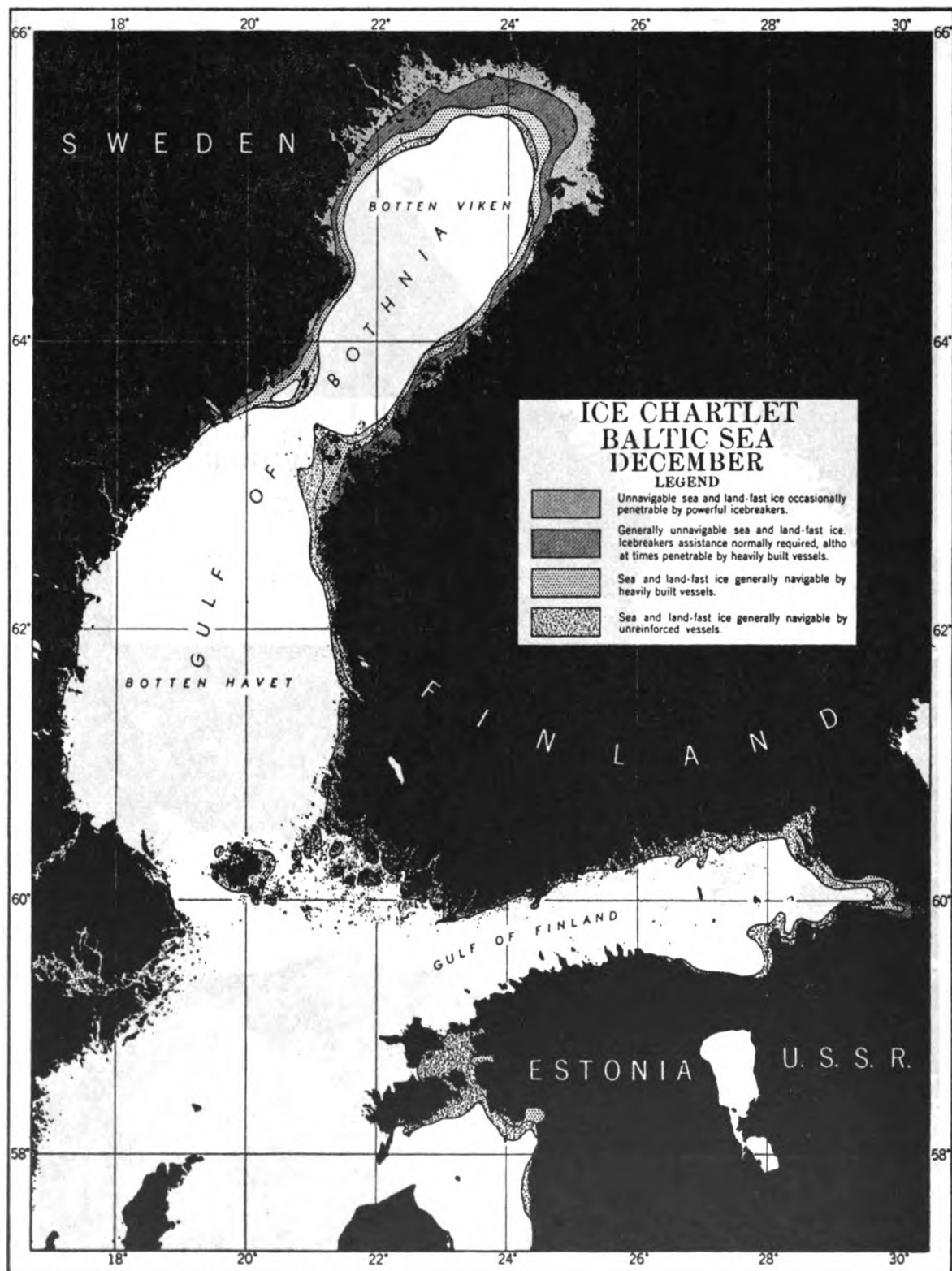
1-47 Navigation in the Gulf of Bothnia and in the Gulf of Finland is hindered by ice in the late fall and spring, and during the winter months the area within the limits of this volume is almost entirely frozen over and closed to navigation. The ports and loading places in the Gulf of Bothnia are usually completely icebound from the Åland Islands northward, and those in the Gulf of Finland are completely icebound as far westward as Tallinn, on the southern side, and Hanko, on the northern side of the gulf. Tallinn, Hanko, and Turku are kept open by ice breakers, but in case Tallinn is closed, Paldiski is used as a winter harbor in its stead, and even in severe winters is accessible with ice breaker assistance.

The dates of the opening and closing of various ports are given with the description of the particular port, and the period during

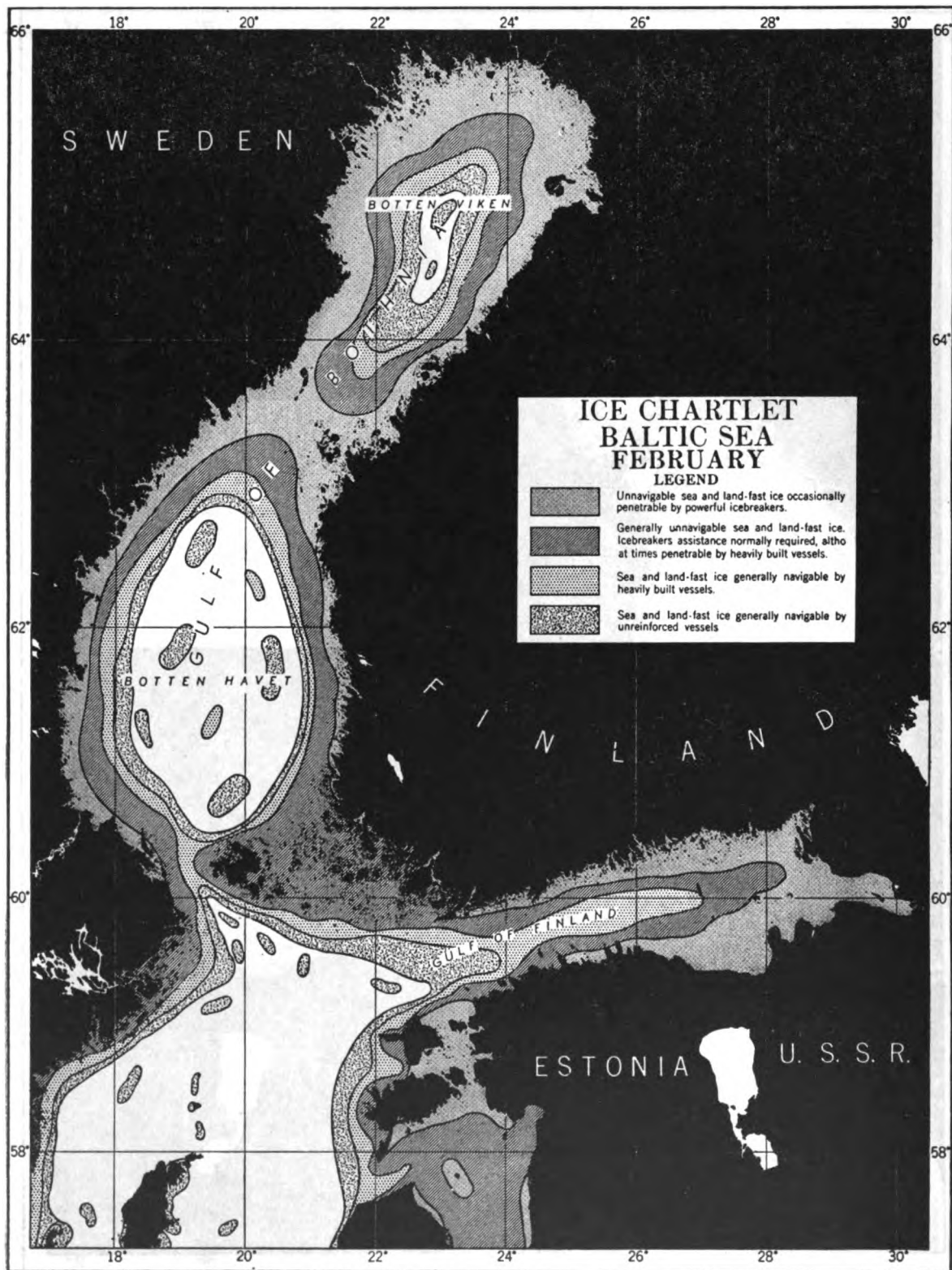
which navigation is obstructed may vary considerably, depending on the severity of the season. The first ice forms along the coast at the northern end of the Gulf of Bothnia and at the eastern end of the Gulf of Finland, and then gradually extends southward and westward, respectively, as the season progresses. Sea ice does not usually form until the last of December or the first of January, and, as indicated by the ice chartlets, it reaches its maximum in March, after which it rapidly disappears. However, under favorable conditions ice may form very quickly in the fall, and in several hours large areas will be covered with pieces of ice which can develop into extensive fields. Falling snow may accelerate this formation.

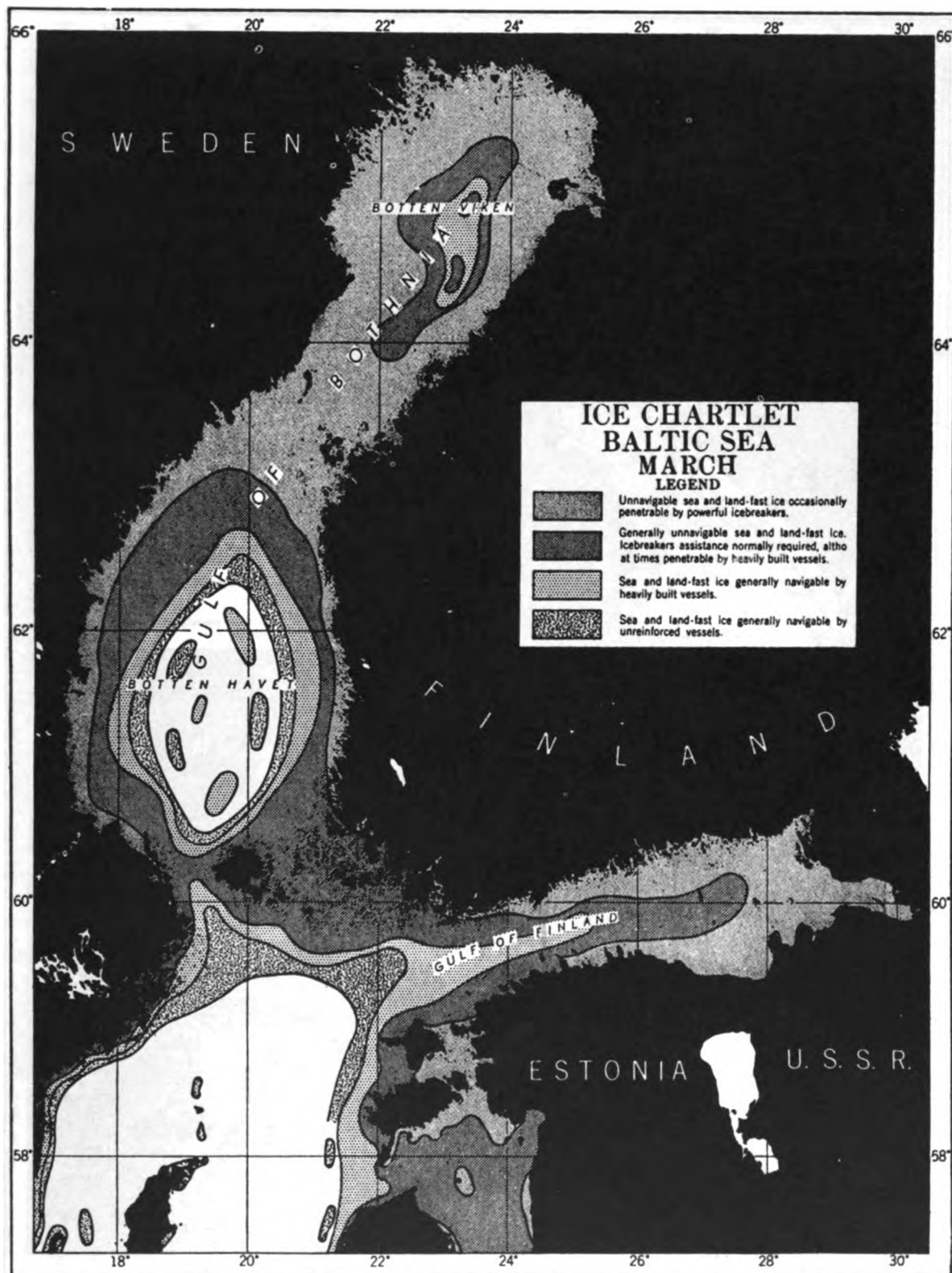
After ice has formed it is often broken up by stormy weather, and wind and seas sometimes pack the broken ice into large hummocks frozen to a depth of 3 feet below the surface. The drift ice may combine into larger masses which can be penetrated only



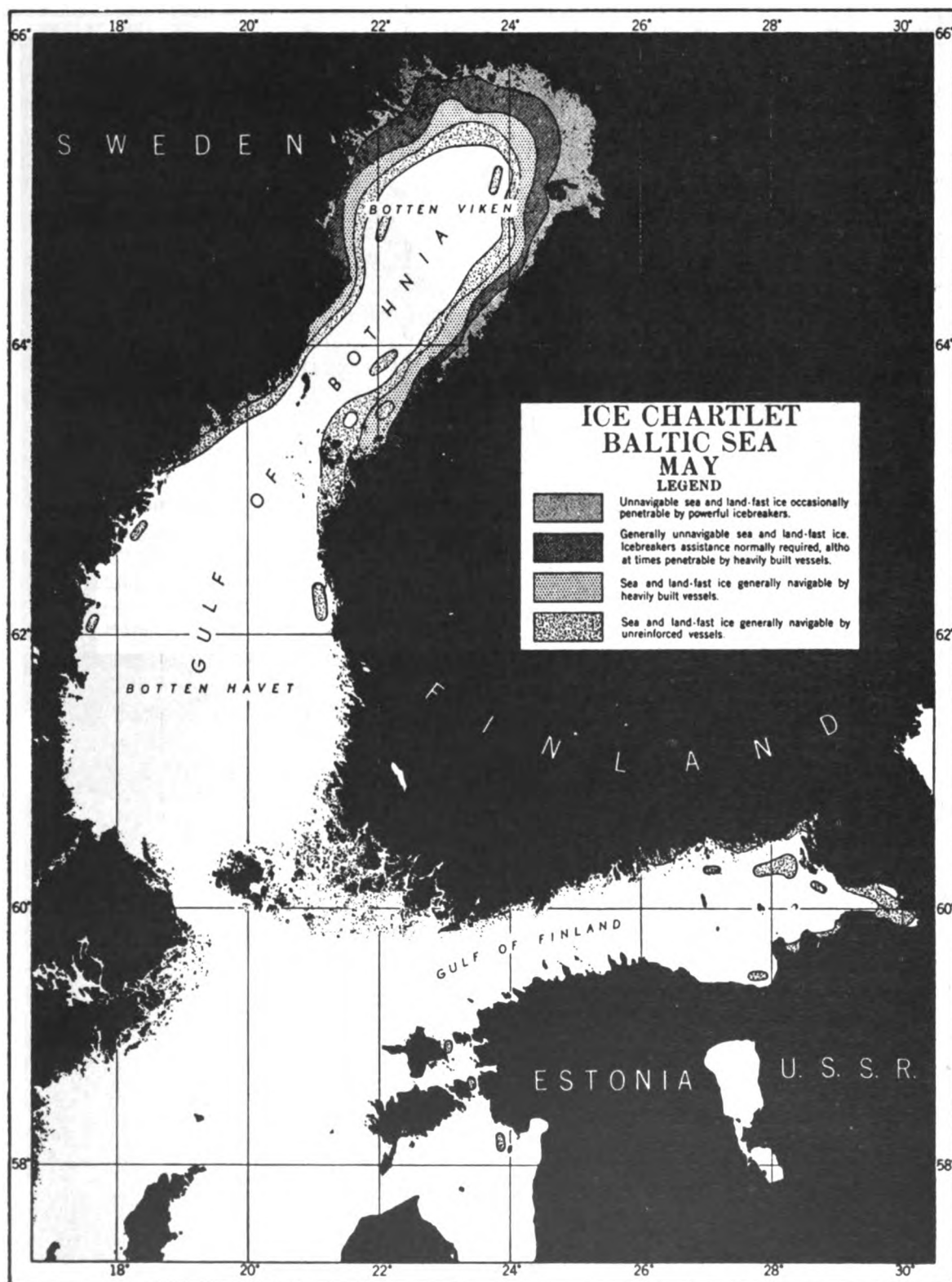


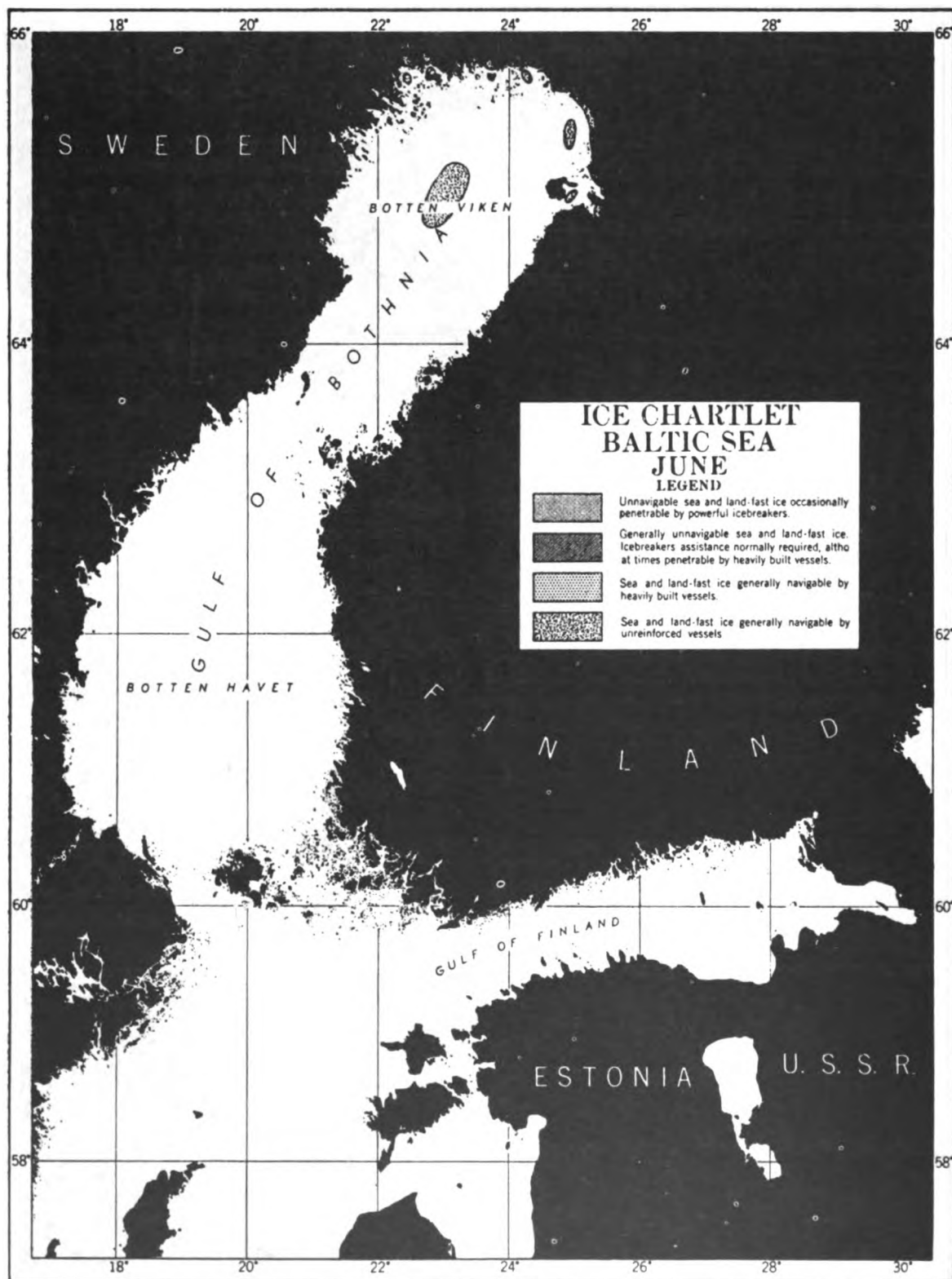












by ice breakers. Mariners may therefore encounter fast, drift, and pack ice in this area, and the ice movement is influenced greatly by the wind and current. With reasonable caution there is relatively little danger from ice during the navigable period, except when vessels linger imprudently in the fall.

The accompanying chartlets show the limits and the types of ice in the Gulf of Bothnia and the Gulf of Finland during the ice season.

GULF OF BOTHNIA

1-48 Ice starts to form along the coast at the northern end of the Gulf of Bothnia about the end of October, and by the end of December has extended southward so that there is landfast ice along the shores of Norra Kvarken and the entire gulf northward of it, however some ports in that area may still be open or penetrable by ice breakers. On the eastern side of the gulf, along the Finnish coast, the ice forms earlier and lasts longer than on the western side. Ice has also started to form along some of the coast southward of Norra Kvarken, but this is mostly on the eastern side of the gulf. In January Norra Kvarken is closed by ice, and in March the gulf northward is almost completely frozen over.

Southward of Norra Kvarken, in January, the ice extends along the coast as far southward as the Åland Islands, around which it has also formed, and again the belt of ice forms earlier and is wider on the eastern side than on the western side of the gulf. Sea ice usually forms early in January. By February the landfast ice has extended seaward. Ålands Hav is frozen over, and in March the maximum ice conditions exist.

The ice disappears rapidly in April, by May most of the gulf southward of Norra Kvarken is clear, and by June most of the northern part of the gulf is free of ice.

Along the coast from Luleå to Kemi there are only about 5 to 6 months of open water. The period of open water lengthens southward and is about 8 months at Gävle. In mild winters it has been possible to keep the ports of Sundsvall, Härnösand, and Gävle open with ice breakers. Finnish harbors are usually frozen longer than the Swedish, but in the spring northeasterly and easterly winds sometimes drive ice across to the Swedish coast where it impedes navigation on that side. At this season the fields of loose ice, almost entirely dependent on the wind, form a serious obstruction to navigation.

GULF OF FINLAND

1-49 Ice first appears in the eastern end of the Gulf of Finland late in November, and in December it forms along most of the northern shore of the gulf and on the southern shore as far westward as Kunda. At this time landfast ice may extend westward to Ostrov Kotlin in the approaches to Leningrad.

In January there is ice along most of the southern side of the gulf, and by the end of the month it extends across the gulf almost as far westward as Iso Tytärsaari. Drift ice may be encountered in the western part of the gulf. In February a farther seaward extension of fast ice occurs, and the gulf may be frozen over as far westward as Ostrov Sur-Sari. The western part of the gulf may be frozen over by the end of February or the first of March, but the fast ice usually only lasts a few weeks and breaks up during the latter part of March.

The amount of ice on any particular part of the coast depends to a great extent on the direction of the wind. In Tallinn harbor drift ice, which is mostly formed by northerly and northeasterly winds, may frequently be driven out again by southerly winds and the place becomes quite safe for shipping even without an ice breaker.

At the entrance of the Gulf of Finland the ice is mostly drift ice which is affected by winds and currents. The ice covering in the gulf may change its nature during the winter from fast to drift or the reverse.

The ice on the southern side of the entrance of the gulf begins to disappear by the end of March, and in April the ice rapidly breaks up everywhere except for a few inlets. Ice usually disappears from the western part of the gulf during the latter part of April and from the eastern end in the early part of May.

The ports in the Gulf of Finland which are kept open during the winter are indicated above in general remarks.

GENERAL NAVIGATION IN THE BALTIC SEA, THE GULF OF FINLAND, AND THE GULF OF BOTHNIA

GENERAL REMARKS

1-50 The Baltic Sea, because of its geographical location in Northern Europe, has a considerable amount of maritime traffic; this is particularly true of the entrances. The greater amount of this shipping consists of comparatively light-draft coastwise vessels. The coasts and channels are well lighted and numerous navigational aids are established, however, some of these may be out

of position or removed during the ice season. Foul weather and fog may be encountered, and because depths in the area are not great and may be irregular, caution should be exercised in conforming to channel limits and laying down a course. Although currents in general are not great in the Baltic, the Gulf of Finland, or the Gulf of Bothnia, they may, at certain times of the year, be increased considerably by river discharge and wind.

BALTIC SEA ENTRANCES

1-51 The Baltic Sea can be entered through the Nord-Ostsee-Kanal (Kiel Canal). or through the Skagerrak and Kattegat and thence by either Öresund, Store Bælt, or Lille Bælt. A vessel's draft and the direction from which she approaches through the North Sea determine which of the routes will be used.

The Nord-Ostsee-Kanal connects the North Sea directly with Kieler Bucht, at the southwestern end of the Baltic Sea. For deep-draft vessels able to navigate only through Store Bælt, the canal route saves about 280 miles from Dover Strait, about 170 miles from Newcastle, and about 35 miles from Pentland Firth. Vessels able to navigate Öresund will save about 100 miles by using it rather than Store Bælt.

TRACKS

1-52 Routes incorporating traffic separation have been established to increase the safety of navigation. Vessels are recommended to use these routes where appropriate. The routes, which are intended for use by all vessels, by day and by night, are not mandatory, and do not give special rights to vessels using them. Vessels should so far as is practicable ensure that their courses conform with those of the traffic lanes. Vessels not using the routes should, so far as feasible, keep well clear of them. Vessels should avoid crossing the routes, and where crossing is unavoidable, do so as nearly as practicable at right angles to the routes. Details of the recommended routes can best be seen on the H. O. Chart of the areas affected by this volume. Directions for negotiating the entrances to the Baltic Sea are given in the Sailing Directions for the Kattegat and the Sound, H. O. Pub. 41. Vessels passing through Öresund proceed to a position southward of Falsterborev Light Vessel, and those passing through Store Bælt, Lille Bælt, or the Nord-Ostsee-Kanal proceed to a position west-northwestward of Arkona Light, on the northern end of Rügen. From these positions in the southwestern end of the Baltic Sea the tracks for the area are described below.

To Baltic Sea ports.—From the position southward of Falsterborev Light Vessel or that west-northwestward of Arkona Light, vessels bound for Gdańsk (Danzig) may pass southward of Bornholm, being careful to avoid Adler Grund, and thence steer for a position off the entrance of the Gulf of Danzig. Vessels bound for ports in the southern end of the Baltic Sea may steer a direct course to most of them from a position northeastward of Arkona Light, but caution must be exercised to avoid such dangers as the shoals on Stolpe Bank and Oder Bank.

Vessels bound for Liepāja (Libau) and ports northward may pass northward of Bornholm, and thence steer a direct course for the approaches to most destinations on that side of the Baltic Sea. Vessels bound for ports on the western side of the Baltic Sea steer to a position eastward of Ölands Södra Udde, and thence as direct as safe navigation permits.

To Gulf of Finland ports.—From the position southward of Falsterborev Light Vessel or that west-northwestward of Arkona Light

steer to a position eastward of Heligholmen Light, on the southern end of Gotland, and thence to a position about 20½ miles northward of Kopu Light, in the entrance of the Gulf of Finland. From this position vessels bound for Tallinn may steer a direct course to a point 3 miles northward of Naissaar Light and thence as in the directions for the port.

Vessels bound for Leningrad steer from the entrance of the gulf to pass northward of Tallinna Madal lighted buoy and Ruuskeri Light and southward of Ostrov Sur-Sari to a position southward of Narvi Light; thence by various courses as in the directions for the port. Vessels bound for ports on the northern side of the gulf may pass close northward of Ostrov Sur-Sari.

To Gulf of Bothnia ports.—From the position southward of Falsterborev Light Vessel or that west-northwestward of Arkona Light steer to a position eastward of Ölands Södra Udde and thence to a position eastward of Svenska Björn Light Vessel. From this position steer as direct as safe navigation permits through Södra Kvarken to a position about 1 mile northeastward of Grundkallen Light Vessel, from which direct courses may be made for the approaches to most ports in the southern part of the Gulf of Bothnia.

Vessels bound through Norra Kvarken may steer a direct course from a position eastward of Grundkallen Light Vessel to a position southeastward of Sydostbrotten Light, favoring that side of the approach, and thence proceed through the buoyed channel to a position about 5 1/2 miles east-southeastward of Holmögådd. Thence direct courses may be made to the approaches to many of the ports in the northern part of the Gulf of Bothnia.

CAUTION

1-53 **Navigational aids.**—During the ice season light vessels and buoys may be out of position or withdrawn, and lights extinguished. Certain lights adjacent to waters remaining navigable will be shown if required. Light vessels may be withdrawn temporarily without notice and without being replaced by a relief light vessel.

Wrecks.—There are numerous wrecks in the entrances of the Baltic Sea, and although many of those in the fairways are buoyed, caution must be exercised. This is particularly true in Kieler Bucht. Uncharted wrecks may still exist in areas which have not been recently surveyed.

Mines.—The entrances to and the southwesternmost end of the Baltic Sea are danger areas because of mines, and there are other mined areas in the Baltic Sea, the Gulf of Finland, and the Gulf of Bothnia. These danger areas and directions for passing through them are described in NEMEDRI (sec. 1-31).

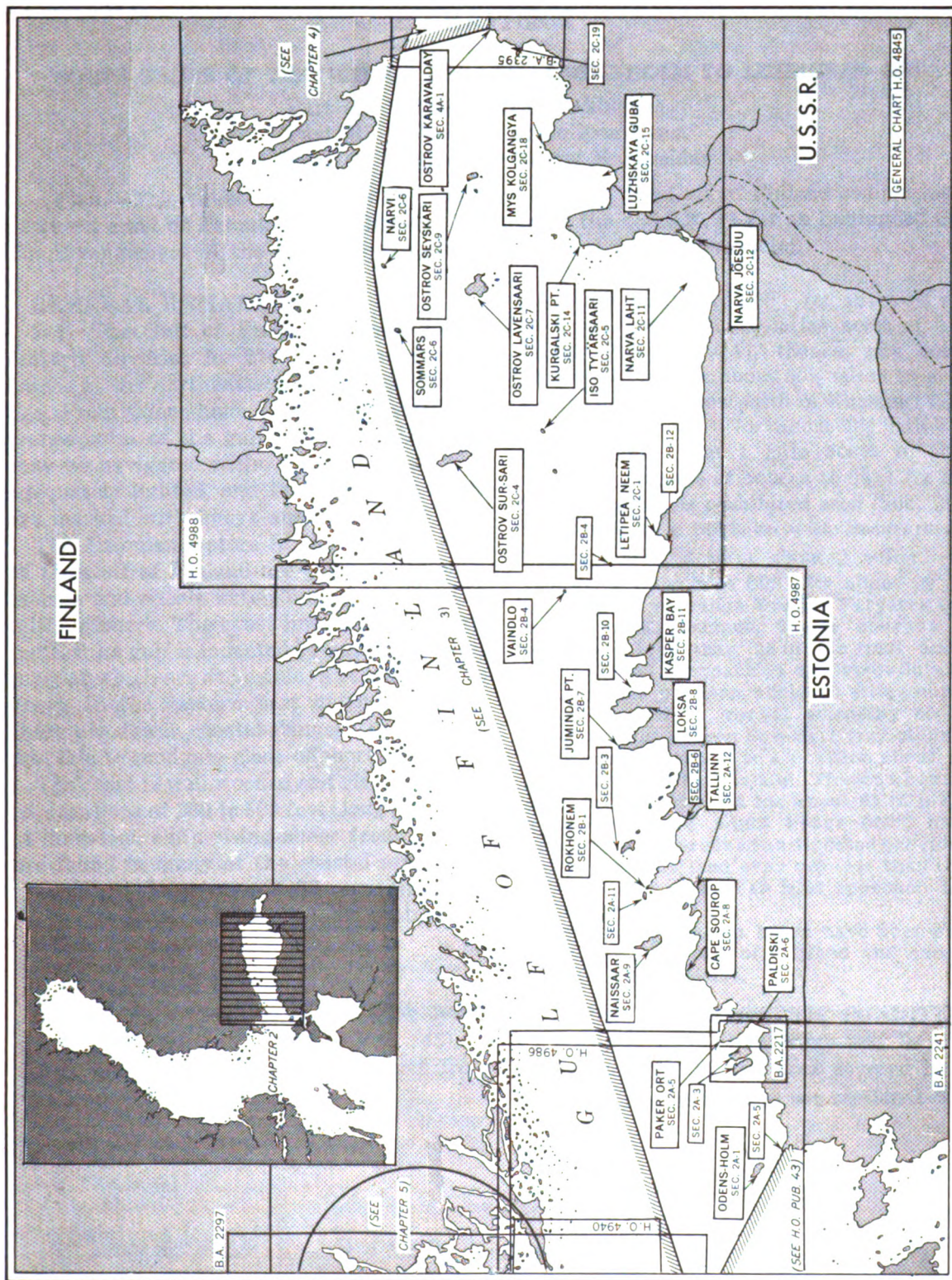


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 2—GRAPHIC INDEX

CHAPTER 2

SOUTH SHORE OF THE GULF OF FINLAND—ODENS-HOLM TO LENINGRAD GUBA

Part A. Odens-holm to Rokhonem

Part B. Rokhonem to Letipea Neem

Part C. Letipea to Ostrov Karavaldy

Plan.—This chapter describes the southern shore of the Gulf of Finland comprising the northern coast of Estonia and contiguous territory of the U.S.S.R. as far as Leningrad Guba. The arrangement of the coastal description is eastward from Odens-holm.

GENERAL REMARKS

2-1 The Gulf of Finland extends in an easterly direction for 210 miles from its entrance at the northeastern part of the Baltic Sea. From Odens-holm, the southwestern entrance point of the gulf, the southern shore may be navigated without difficulty, as it is adequately lighted, and the dangerous areas are marked with buoys and beacons.

The Estonian waters in the western part of the Gulf of Finland are encumbered with islands and shoals extending as much as 12 miles offshore. The coast line in the western part of the gulf is indented by numerous bays, most of which are accessible to vessels of deep draft. In the eastern part of these waters there are fewer coastal dangers and vessels are able to navigate close offshore.

The coast is well wooded and rises in places to elevations of 260 to 300 feet; long stretches of limestone cliffs rising sheer from the sea are found in many of the coastal areas.

Caution.—See section 1-32 regarding lack of navigational information in waters of U.S.S.R.

NAVIGATION

2-2 From a position about 20½ miles north of Kõpu Light (H.O. Pub. 43), a vessel entering the Gulf of Finland from

westward may steer 069° for about 83 miles to a position about 10 miles north of Aegna Island (sec. 2A-11), thence may steer a course of 076° for about 60½ miles to a position about 1½ miles north of Ruuskeri Light. A course of 090° for about 9¾ miles will thence lead about 1 mile south of Ostrov Sur-Sari; a change of course to 061° for about 22 miles avoids a prohibited area (Sec. 2C-2) and leads to a position with Sommars Light bearing 000°, distant about 2 miles. From thereon a course of 099° for about 56 miles leads to the entrance Yuzhny Farvater which leads to Kronshtadt. These courses lead over not less than 28 m (15 fms) and the nearest land approach is off Ostrov Sur-Sari.

From the position about 10 miles north of Aegna Island, a vessel intending to pass northward of Ostrov Sur-Sari may steer 071° for about 70 miles to a position about 1 1/2 miles north of that island. Thence a course of 083° may be steered for about 21 miles, and when Sommars Light bears 000°, distant about 2 miles, proceed as directed previously. These courses lead over not less than 18.3 m (10 fms). The nearest land approach is off Ostrov Sur-Sari.

Traffic separation lanes have been established in the Gulf of Finland and can best be seen on the chart.

ABNORMAL MAGNETIC CONDITIONS

2-3 Magnetic disturbance may be experienced in parts of the area covered by this chapter. For particulars see section 1-9.

CURRENTS—WINDS

2-4 During westerly and southwesterly winds a current sets into the Gulf of Finland nearly parallel with its shores. With a lessening of the wind the current generally sets in the opposite direction; it is felt very strongly after the break up of the ice in the early spring. A set into the bays and bights on the southern shore of the gulf will usually be experienced should there be any northing in the direction of the wind.

While the tidal range in this area is of little consequence, considerable change in the water level may be caused by strong winds, variation in the atmospheric pressure, and the seasonal amount of water released by the rivers.

Ice

2-5 Ice conditions prevail in the area covered by this chapter. For particulars see section 1-47 and consult the ice chartlets in chapter 1.

Part A: ODENS-HOLM TO ROKHONE/M

2A-1 Odens-holm (Ossmussaar) ($59^{\circ}18' N.$, $23^{\circ}22' E.$) lying in the southwestern entrance of the Gulf of Finland, is about $2\frac{1}{2}$ miles long in a northwesterly-southeasterly direction. On the northern side are 30-foot overhanging cliffs. A village on a hill in the middle of the island has two windmills close by and about $\frac{1}{2}$ mile southeastward there is a white church with a black spire. A dangerous wreck lies about $\frac{1}{2}$ mile northwestward of the island. The island is fringed by reefs up to $\frac{1}{2}$ mile offshore and from the southeastern end a rocky ledge extends about $2\frac{1}{4}$ miles toward the coast; at the southern extremity of this ledge is a rock with a depth of 2.7 m ($1\frac{1}{2}$ fms).

A light is shown on the northwestern tip of Odens-holm and a fog signal is sounded. A radiobeacon transmits from the light. A pair of lights in range 316° are shown on the western side of a cove near the southwestern extremity of the island. Anchorage may be had off the southern side of the island about $2\frac{1}{2}$ miles southward of the church in 12.8 m (7 fms), sand and rock. Vessels may also anchor about $\frac{1}{2}$ mile off the northeastern side of the island in 21.9 m (12 fms). A submarine cable (sec. 1-34) is laid between the southern end of Odens-holm and the mainland at Poosapaa Neem, about 4 miles southeastward. Anchoring in the vicinity, or passing over this cable is prohibited. A light is shown from Poosapaa Neem.

Prohibited area.—A circular area nearly $7\frac{1}{2}$ miles in diameter, with its center about $5\frac{1}{2}$ miles east-northeastward of Odens-holm Light, is prohibited to all vessels.

A naval exercise area about 7 by 29 miles in extent, lying in a east-northeast and west-southwest direction is centered about 11 miles north-northeastward of Odens-holm Light.

COAST—GENERAL

2A-2 Between Odens-holm and Tallinn the coast of the mainland trends east-northeastward about 43 miles. The shore is of variable aspect, from low and sandy and bordered by woods to wooded hills in places. Foul ground fringes this stretch of coast, and several rivers discharge into the gulf. A number of off-lying islands are in this area, and shoal banks and patches are found up to 10 miles offshore.

DEPTHS — DANGERS — OFF-LYING BANKS AND ISLANDS

2A-3 All dangers along the immediate coast from Põsapaä Neem to Tallinn are contained within the 30-fathom curve which has a greatest distance offshore of about 6 miles.

SANDGRUND, a shoal with depths less than 1.8 m (1 fm) and marked by spar buoys, lies about 3 miles east-northeastward of the light structure on Poosapaa Neem. About 1/2 mile southwestward of Sandgrund is a rock with a depth of about 0.3 m (1 ft.) and marked on its northern side by a spar buoy.

NY GRUND (Neugrund), with depths less than 1.8 m (1 fm), is an extensive group of rocks lying about 4 1/2 miles east-northeastward of Odens-holm Light; it is marked by spar and light buoys. A stranded wreck lies on the eastern side.

GRAS GRUND (Krassigar), a rocky shoal marked by spar buoys lies about 11 miles northeastward of Poosapaa Neem.

WEST RAGO AND EAST RAGO (BOLSHOI ROOG-E AND MALI ROOG-E) (Suur Pakri and Valke Pakri), two islands lying about 3 miles eastward of Gras Grund, are separated from each other by a shallow passage, with a least depth of 0.9 m (3 ft.), in which there are a number of islets. Several villages and windmills are noticeable on the islands. A light is shown on the northwestern extremity of West Rago. A rocky patch, with a least depth of 0.9 m (3 ft.), lies about 1 mile westward of West Rago. Three towers stand on the northern end and a light is shown from the northeastern end of East Rago.

PAKER ORT SHOAL (PAKERORTSKAYA) (Pakrimadalik), a rocky area defined by the 5-fathom curve and having a least depth of 5.5 m (3 fms), lies about 4 miles northeastward of the northern extremity of East Rago. A light buoy is moored on the northern edge of the bank.

LOKHOSAL SKAR (Lohusal Madalik), a rocky patch with a depth of 4.9 m (2 3/4 fms) lies about 4 miles eastward of Paker Ort

Shoal. It is marked on its northern side by a SPAR BUOY.

The several dangers to be encountered in the approaches to the port of Tallinn are described in sections 2A-9 and 2A-10.

NAVIGATION

2A-4 From a position about 20 1/2 miles north of Kopu Light, a vessel entering the Gulf of Finland may steer a course of 072° for about 74 miles to a position about 1 1/2 miles north of Naissaar Light, thence a course of 077° for about 16 miles leads to a position about 3/4 mile south of Keri Light. These tracks lead over not less than 18.3 m (10 fms).

A vessel may proceed on a more inshore track from the afore-mentioned position north of Kopu Light, steering 078° for about 67 1/2 miles to a position 1 1/2 miles north of Cape Sourup. This course leads over not less than 44 m (24 fms).

COASTAL FEATURES—LANDMARKS

2A-5 POOSAPAA NEEM (Spithamn Nina) is densely wooded. On the eastern side of the cape is Poosapaa Kula and a conspicuous ridge on which there are several windmills. A reef extends about 400 yards northwestward from the extremity of Poosapaa Neem, and a 7.3 m (4 fm) patch lies about 3/4 mile northwestward of this point. A 3 m (1 3/4 fm) patch, lies about 2 miles northwestward of Poosapaa Neem.

The coast **FROM POOSAPAA NEEM TO TOOMA NINA**, about 4 3/4 miles east-northeastward, is sandy with wooded hills in places and fringed by foul ground. There is a conspicuous mill on the western side of Tooma Nina.

KEIBU LAHT, entered between Tooma Nina and Risti Nina, about 2 3/4 miles northeastward affords anchorage in a depth of about 5.8 m (3 1/4 fms), sand and mud, sheltered from northeast through south to west. A narrow reef, with rocks above water, extends nearly 1 mile westward from the eastern side of the bay about 1 mile southward of Risti Nina. Small craft may obtain shelter from northerly winds southward of this reef off the village of Keibu.

RISTI NINA (59° 16' N., 23° 44' E.), from which a **LIGHT** is shown, has a small bay on its eastern side where small craft may obtain **ANCHORAGE**. Similar anchorage may be had off Kibru Kula, situated about 3 1/4 miles east-northeastward of Risti Nina; the Vikhterpä Jogi flows into the gulf about 1 1/2 miles southeastward of the village. Near its mouth on the high ground there is a conspicuous house visible over the trees. The village of Vikhterpä (Vihterpalu) is situated on the west bank of the river about 1/2 mile from its entrance; 4 1/2 miles farther eastward is the village of Kurks (Kurkse).

CAUTION.—Navigation is prohibited within an irregularly shaped area extending eastward along the mainland from just east of Risti Nina to Paldiski Laht and up to about 5 miles off the mainland shore between Gras Grund and East Rago.

PALDISKI LAHT, situated between East Rago and the mainland, is the most sheltered bay in Estonia, the **ANCHORAGE** being open only to the northwestward. The eastern shore is high while the southern shore is low and marshy in places.

PAKER ORT (Pakrineem), the northernmost point of the mainland on the eastern side of Paldiski Laht, is high and wooded and one of the best landmarks for vessels bound into the Gulf of Finland. A reef with a depth of 3 m (1 3/4 fms) extends about 1/4 mile northward from Paker Ort, and a reef also extends about 1/2 mile west-northwestward from the point. A spar buoy is moored about 1/2 mile west-northwestward of Paker Ort light; this light is shown about 1/4 mile south-southwestward of the tip of the point and the ruins of the old lighthouse stand close westward. A radiobeacon transmits on Paker Ort.

Several large mooring buoys are anchored in the middle of Paldiski Laht between Paldiski and East Rago.

PALDISKI

Position: 59° 21' N., 24° 00' E.

Depths: Anchorage, 18.3 m (10 fms).
Entrance to basin, 7 m (23 ft.).
At Quays, 6.1 to 7 m (20 to 23 ft.).
New Harbor pier, 5.5 to 7.9 m (18 to 26 ft.).

2A-6 The port of Paldiski consists of an artificial harbor protected from seaward by a mole, adjacent to the town of Paldiski and the waters surrounding a pier about 1 1/4 miles to the southeastward.

NAVIGATION.—From a position 20 1/2 miles north of Kopu Light, a vessel entering the Gulf of Finland from the westward, and bound for Paldiski, may steer a course of 082° for about 55 miles, passing northward of Ny Grund, to a position about 1 1/3 miles north of Vesternes Neem, the northernmost point on East Rago. Thence a course of 135° may be steered for about 3 1/2 miles to a position about 1/2 mile off the town. A course of 175° for an additional 1 1/4 miles will lead to the anchorage.

NAVIGATION SEASON.—Normally the period is from March 15 to February 1.

ICE.—Paldiski Laht is kept open by ice breakers throughout the winter. The harbor of Paldiski is very rarely blocked by ice and is therefore used as a winter harbor for Tallinn.

DEPTHS.—Paldiski Laht has a depth of 42 m (23 fms) in the entrance, decreasing gradually toward its head. Northward of the port of Paldiski a shore bank extends from 200 to 700 yards offshore to the 3-fathom curve. Nearly 1/2 mile northward of the town a spit, formed by the remains of an old stone mole, extends about 400 yards from the shore abreast the ruins of a fort. It is marked at its outer edge by a light buoy and a spar buoy. The depth at the entrance to Old Harbor is 7 m (23 ft.); depths in the basin vary from 6.1 to 7 m (20 to 23 ft.). Easterly winds cause the water to fall, westerly winds to rise, the difference between highest and lowest water amounting to about 0.9 m (3 ft.). Depths alongside the pier at New Harbor range from 2.4 to 7.9 m (8 to 26 ft.).

LANDMARKS.—The spire of a church and several buildings in the town are conspicuous;

the church at Madise, about 4 miles south-southeastward of the town is prominent.

LIGHTS.—A light is shown from the head of each of the two moles in the entrance of the harbor.

Two lights in range 140°, located at Madise, lead through the entrance of the basin.

HARBOR.—Old Harbor is situated on the eastern side of Paldiski Laht about 2 miles southward of Paker Ort Light. It is in the form of a single basin about 480 feet long, from 120 to 240 feet wide and approached through an entrance about 90 feet in width. New Harbor consists of a single finger pier, 1 1/4 miles southeastward of Old Harbor, which, extending from the shore, provides about 700 feet of berthing space on either side. A light is shown from the pier.

A light buoy is moored about 900 feet south-eastward of the above pier.

ANCHORAGE can be taken in a depth of 18.3 m (10 fms), soft mud, about 1 1/2 miles south-southeastward from the entrance to Old Harbor. Small vessels may obtain anchorage about 3/4 mile south-southeastward of the southeastern point of East Rago in a depth of about 4.9 m (2 3/4 fms), mud and sand.

CAUTION.—Anchoring and fishing is prohibited in an area about 1/2 mile wide extending from the shore at Paldiski in a west-southwesterly direction to the shore on Vaikse Pakri.

PILOTAGE is not compulsory; no government pilots are available at the port. Pilots for Paldisk Laht can be obtained from Naissaar or Osmussaar.

2A-7 Paldiski is a small town lying close along the shore and having a population of about 2,000. Harbor works were reported in progress in 1959. The town has a post office and customhouse. The harbor is chiefly used for the export of potatoes, fish, and forest products. In the harbor basin there is a total quayage length of 1,320 feet, with 6.1 to 7 m (20 to 23 ft.) alongside, and a considerable warehouse capacity; it is served by a railroad which connects with Leningrad and Tallinn. Fresh water is piped to the quay. A pier southward of the harbor basin has about 700 feet of berthing length on each side with depths of 5.5 to 7.9 m (18 to 26 ft.) alongside. Provisions are obtainable in small quantities. Fuel oil is available.

COASTAL FEATURES—LANDMARKS (Continued)

2A-8 BETWEEN PAKER ORT AND CAPE SOUROP (Cape Suurup) (59° 29' N., 24° 23' E.), about 11 miles northeastward, the coast is

divided into two bays by Lokhosai Point (Lohusalunina), which is wooded and has foul ground extending from it for about 1/2 mile westward and depths of less than 9.1 m (5 fms) within 1/2 mile northward. A wreck, with 0.9 m (3 ft.) over it, lies less than 1/2 mile northward of the point. A hill, inland about 2/3 mile from the point, has a village close eastward of it. A detached 4.9 m (2 3/4 fms) shoal, marked by a spar buoy on its northern side, lies about 1 mile northward of Lokhosai Point.

LAHENE BAY (Lahepere Laht), the western bay, has depths of about 33 m (18 fms) at its entrance, decreasing gradually toward its head. The eastern side of the bay is shallow with depths of 0.9 m (3 ft.) extending 1/2 mile from the shore. Anchoring and fishing are prohibited in Lahene Bay.

LOKHOSAI LAHT (Lohusalu Laht), lying between Lokhosai Point and Cape Sourop, affords anchorage for small vessels in a depth of about 5.8 m (3 1/4 fms). Two rivers discharge along this coast. A lookout tower at Joa Moisa, about 3 miles eastward of Lokhosai Point, and another lookout tower, nearly 1 1/4 miles south-southeastward of the rear light on Cape Sourop, are conspicuous.

CAUTION.—An area prohibited to anchoring and fishing has been established extending from Paker Ort Light (sec. 2A-5) to a position about 2 miles northward of the northern extremity of Naissaar, thence eastward to the northern extremity of Wrangel (Prangli Saar) Island, thence southward along the western shore of Wrangel Island to the southwestern extremity, thence to Igosai Point (Ihasalu Laht). Navigation is prohibited within an irregularly shaped area extending northeastward from just off Lohusalu Madalik to about 2 miles westward of Ninamaa.

SOUROP (Suurup) is a broad hilly promontory about 140 feet high. Cape Sourop, its northwestern extremity, is wooded and prominent. A LIGHT (high light) is shown about 1 mile southeastward of Cape Sourop. A LIGHT is shown about 1 3/4 miles eastward of the cape. These two lights are in RANGE 246 1/2°. There is a signal station near the high lighthouse connected by telephone with Tallinn.

ICE SIGNALS are displayed, and a fog signal is sounded at this station. PILOTS may be obtained from Sourop high lighthouse. A LIGHTED WHISTLE BUOY marking a shoal patch is moored about 1 mile northwestward of the point. A rock with a least depth of 1.5 m (5 ft.) lies about 3/4 mile northeastward of the same point. A lighted buoy with a radar reflector is moored about 2 miles northwestward of the cape. A rock, with a depth of 0.4 m (1 ft.) lies about 600 yards north-northwestward of Cape Sourop.

CAUTION.—The passage between Naissar and Sourop is closed. When Naissar Light (sec. 2A-9) shows red the passage between Naissar and Aegna Island (sec. 2A-11) is closed temporarily.

2A-9 NAISSAAR, situated in the entrance to Tallinn Bight, is 82 feet high and densely wooded. A gap has been cut through the woods at the southeastern end of the island so that Sourop high light can be seen on a 228° bearing which leads clear of the reef northward of Aegna Island.

A small L-shaped pier, with 3.3 m (11 ft.) alongside, is situated on the eastern side of Naissaar about 1 mile from the southeastern end of the island. A **LIGHT** is shown on the shore about 400 yards southward of the pier.

A light is shown on Basanova Point (Hulgekarl Ots), the southeasternmost point of the island.

A bank, defined by the 6-fathom curve, surrounds the island and is marked by **SPAR BUOYS** at its northern and southeastern extremities. A rock, with a depth of 2.7 m (9 ft.), lies about 700 yards northwestward of the westernmost point of the island; an 5.5 and 5.8 m (18 and 19 ft.) patch lie, respectively, about 1/2 mile northward and southward of the rock. A 2.7 m (9 ft.) patch lies nearly 1 mile southwestward of the light on the northern part of the island.

A light is shown on the northern end of the island. A radiobeacon transmits from the light and a fog signal is sounded. There is a **SIGNAL STATION** near the lighthouse; ice signals (sec. 1-15) are shown from this station.

LEONTIVA SHOAL, a 10 m (5 1/2 fm) patch marked by a spar buoy, lies about 2 miles southeastward of Naissaar.

TCHERNAYA SHOAL, with two 9.1 m (5 fm.)

patches as a least depth, lies about 1 1/2 miles eastward of the southeasternmost point of Naissaar.

EXPLOSIVES DUMPING AREA.—An explosives dumping area about 2 by 3 miles in extent lies centered about 7 miles north-northwestward of Naissaar.

SUBMARINE CABLES (sec. 1-34) are laid between the southern end of Naissaar and the mainland in the vicinity of Cape Sourop with a branch to Kakomiag Point. Cables are laid to Tallinn and Aegna Island from the southeastern side of Naissaar.

TALLINN BIGHT

2A-10 Tallinn Bight is entered between Cape Sourop and Aegna Island, about 13 miles east-northeastward; its southern shore is indented by Kakomiag Bay, Teliskopli Laht, and Tallinn Roads.

A dangerous **WRECK** lies about 1 1/2 miles southward of Naissaar (sec. 2A-9).

KAKOMIAG BAY (Kakumae Laht) is contained between Merre Point, about 3 1/2 miles eastward of Cape Sourop, and Kakomiag Point (Kakumaeneem) 3 miles farther eastward; this latter point is high, steep, and wooded on its extremity. A light is shown close northward of Kakomiag Point. A rocky shore bank extends about 3/4 mile northward from this point. A spar buoy marks its outer edge.

TELISKOPLI LAHT (Tsigelsko Bay) is entered between Kakomiag Point and Teliskopli (Tsigelsko) Point, nearly 2 1/2 miles eastward; the latter point is the northwestern extremity of a peninsula separating Teliskopli Laht from Tallinn Roads. On the southwestern side of the peninsula are two ship-building yards, the buildings of which are conspicuous from seaward. The northern

yard has depths of 5.5 to 10 m (3 to 5 1/2 fms). A breakwater protecting the basin has an unbroken segment on its inner side which is used for berthing. This berth is about 1,400 feet long with depths of 5.5 to 7.9 m (18 to 26 ft.) alongside. A wharf in the basin is about 800 feet long and has a depth of 9.4 m (31 ft.) alongside. There is a total of about 1,000 additional feet of berthing space in the basin with depths of 5.5 to 7.9 m (18 to 26 ft.) alongside. The southern yard has depths of 3.6 to 6.4 m (2 to 3 1/2 fms); the breakwater protecting the basin has along the inner side a total of about 1,550 feet of berthing space with depths of 5.5 to 6.4 m (18 to 21 ft.) alongside. A quay in the basin is about 550 feet long and has depths of 3.3 to 5.5 m (11 to 18 ft.) alongside.

PROHIBITED AREA.—See section 2A-8.

A light is shown on the head of the mole of the southern yard. A pair of **LIGHTS** in range 140°, situated on the shore at the head of **Teliskopli Laht**, lead into the bay. A shore bank extends northward and westward from **Teliskopli Point**, the outer edge of each being marked by a **SPAR BUOY**.

KARL ISLAND is a flat peninsula lying between **Teliskopli Laht** and **Tallinn Roads**. A shore bank extends about 1 mile northward from the peninsula; its outer edge is marked by a light buoy. A submarine cable (sec. 1-34) is laid between the eastern side of **Naissaar** and **Karl Island**.

VAHEMADAL, a rocky patch with a least depth of 3.6 m (12 ft.), lies 1 3/4 miles north-northwestward of **Karl Island**. It is marked on its northern, eastern and western sides by spar buoys. A lighted whistle buoy with a radar reflector is moored southward of **Vahemadal**.

NAISSAAR SKAR (**Naissaare Madal**), with a least depth of 1.2 m (4 ft.), lies about 3 miles southeastward of **Naissaar Light**. It is marked on its northern and southern sides by one spar buoy each, and on its western side by two spar buoys.

LITTLE GROUNDS (**Littegrund**) consists of two rocky patches, having least depths of 0.6 and 5.5 m (2 ft. and 3 fms), lying about

4 1/2 miles southeastward of **Naissaar Light**; the patches are about 600 yards apart. **Little Grounds** are by a beacon, and the southern and southeastern sides by a **SPAR BUOY**.

NEW MIDDLE (**Kesk Madal**), a shoal with a least depth of 7.3 m (4 fms), lies about 4 miles east-southeastward of the northern extremity of **Naissaar** and is marked on its eastern side by a spar buoy.

RAGNIL (**NOVAJA**) **GROUND** (**Uus Madalik**), a ledge with a least depth of 3.6 m (2 fms), lies about 5 miles north-northeastward of **Naissaar Light**. It is marked on its northwestern, western, and southeastern sides by spar buoys. A 8.2 m (4 1/2 fm) patch eastward of the ledge is marked on its eastern side by a light buoy with a radar reflector.

TALLINNA MADAL, a semicircular reef with a least depth of 1.2 m (4 ft.), lies about 9 1/4 miles northeastward of the northern extremity of **Naissaar**. A light is shown on the reef; the northwestern and southern extremities are each marked by a spar buoy.

2A-11 AEGNA ISLAND, on the eastern side of the entrance to **Tallinn Bight**, is high and densely wooded. **Lemika Point** is the extremity of a narrow, sandy isthmus extending 1/2 mile from the northeastern side of the island. On the southern side of the island there is a boat pier with a depth of 3.3 m (11 ft.) alongside. A reef, defined by the 6-fathom curve, extends nearly 1 1/2 miles northwestward and 1/2 mile westward from the island; on it are numerous rocks. A spar buoy marks the northern edge of the reef and a lighted buoy marks the western side.

A light is shown from a structure situated on a rock about 1 mile north-northwestward of the northwestern point of **Aegna Island**.

A **LIGHTED WHISTLE BUOY** is moored about 1/2 mile northwestward of **Aegna Light**. A light is shown from the head of the pier on the southern side of the island. A lighted buoy is moored on the western side of the channel about 2 1/4 miles west-northwestward of **Aegna Light**.

A rocky head, with a depth of 0.9 m (3 ft.) and marked on its southeastern side by a spar

BUOY, lies about 300 yards southeastward from the eastern extremity of Aegna Island. Between Aegna Island and GROSHOLM (Krasulisaar), a low wooded islet lying about 1/4 mile southeastward, a channel with a depth of 7 1/2 feet is marked by DAYMARKS in range 063° and by spar buoys. A daymark in range 017° with a beacon, are situated about 500 yards south-southwestward of the beacons on Lemika Point. An above-water reef, marked on its western side by a spar buoy, lies about 1/2 mile southwestward of Grosholm. Close eastward of Grosholm is Kumplas, a flat islet, and about 1 1/4 miles southward of Grosholm lies Pandi (Pandju), an islet; foul ground intervenes between it and the coast. A submarine cable (sec. 1-34) is laid between Aegna Island and the eastern side of Naissaar.

PROHIBITED AREA.—See section 2A-8.

MEASURED DISTANCE.—A measured distance of 24,428 feet, in Tallinn Bight, on a range of 159° - 339°, is marked by three pairs of BEACONS situated on the eastern shore; each pair of beacons in line bears 069°. This distance is also marked by SPAR BUOYS numbered 1 to 9 from southward, with numbers 1, 5, and 9 moored on the alignment of the three pairs of beacons. The central pair of beacons divides the measured distance into two sections, the southern being 12,284 feet and the northern 12,144 feet.

LIFESAVING.—A motor lifeboat is maintained near the entrance of the mouth of the Pirita Jogi located about 5 miles south-south-eastward of Pandi.

TALLINN ROADS, the southeastern part of Tallinn Bight, is open to the northward, and strong winds from that direction cause heavy seas, especially during the autumn. The bottom in the deeper parts of the roads, 29 to 35 m (16 to 19 fms), is soft mud; closer in, off the eastern shore, in 18.3 to 24 m (10 to

13 fms), it is sand, with rocks in places, and off the western shore, in 14.6 to 18.3 m (8 to 10 fms), mud, sand, and stones.

A dangerous wreck lies on the shorebank on the eastern side of the roadstead.

A mole, about 600 yards in length, extends eastward from the eastern extremity of Karl Island. Vessels lie along its inner end where there is 7.3 m (24 ft.) alongside. It was reported (1947) that the outer part of the mole was in ruins.

VIIMSI LIGHT BEACONS, in range 083 1/2°, stand on the eastern shore of Tallinn Roads about 800 yards southward of the central pair of beacons mentioned above. Steering on the Viimsi Range will lead to an intersection with the Tallinn Roads Range (sec. 2A-9). A light is shown from the extremity of South Mole in Pirita.

TALLINN

Position: 59°27'N., 24°46'E.

Depths: Approach channel, 14.9 m (49 ft).

Anchorage, 18.3 m (10 fms).

Outer (Naval) Harbor, 5.5 to 14.9 m (18 to 49 ft).

Inner Harbor, 8.8 to 10.9 m (29 to 36 ft.).

New Harbor, 0.3 to 7 m (1 to 23 ft.).

Caravan Harbor, 5.5 to 9.9 m (18 to 32 3/4 ft.).

Peetri Harbor, 9.7 m (32 ft.).

Seaplane Harbor, 7 m (23 ft.).

Port plan: See section 2A-20.

2A-12 The port of Tallinn has been opened to foreign shipping (1967).

The artificial port is protected by moles; it includes Old Harbor, New Harbor, and several smaller sheltered areas.

NAVIGATION

2A-13 Foreign vessels may enter Tallinn through North Passage only. See section 2A-19.

Navigation season.—Navigation is generally maintained the year round except during a particularly severe winter. As a rule the port is kept open by icebreakers from about the middle of January to the end of March, with sometimes only a single lane available to shipping. Ice has appeared as early as November and lasted until May.

WINDS

2A-14 In Tallinn Roads the prevailing winds are westerly or southwesterly, but northeasterly winds are the strongest. With strong northerly winds the heavy seas and swell render it difficult for vessels to maneuver in the harbors of the port.

DEPTHS

2A-15 The depths in the approach channel in Tallinn Bight and Tallinn Roads decrease from 40 fathoms at the outer end to slightly over 8 fathoms at the head of the roadstead. Depths at the designated anchorage in the roads vary from about 8 to 12 fathoms. The several sheltered harbor areas have depths of 1 to 49 feet. Tallinn (Old) Harbor, the principal harbor of the port, is approached through two entrances and consists of three adjacent basins. Inside the harbor, depths vary from 18 to 49 feet with depths slightly less alongside the quays. Depths in Seaplane and Peetri harbors are reported (1962) to be 23 and 32 feet, respectively, while project depths to and alongside the southern quay in Caravan Harbor are 32¾ feet. New Harbor has depths of 1 to 23 feet.

LANDMARKS

2A-16 The most conspicuous structure on approaching Tallinn is Oleviste church on the northern side of the city, the spire having an elevation of 459 feet. A cathedral spire is prominent about ¼ mile south-southwestward of the church, and close southward of the cathedral is another church with five circular towers. Pikk Herman, the old citadel with a high tower, standing on a high precipitous ledge, lies about ½ mile southwestward of Oleviste church. High and steep Lasna Magi, with the white houses of Marienberg on its seaward edge, is situated between

the northeastern end of the city and Pirita Jõgi (sec. 2A-11).

HARBOR

2A-17 Tallinn Harbor, fronting the eastern end of the town, has two entrances and comprises an outer (Naval) and an inner harbor with three adjacent basins. The outer harbor is contained on the northern side by a curved mole, which is a continuation of the northwestern mole of the inner harbor. A detached curved mole protects the outer harbor on the eastern side.

New Harbor is situated in the southwestern part of Tallinn Roads. It is enclosed on the northwestern and southeastern sides by two moles extending from the shore; between the heads there is a detached mole with an entrance at either end. In the middle of New Harbor is a rocky ledge with a least depth of 1 foot, marked by spar buoys. A light buoy is moored about 100 yards southward of the northwestern entrance of the harbor. Each entrance is about 20 feet deep and there are depths of 18 to 20 feet in the basin.

Adjoining New Harbor to the northwestward is Caravan Harbor which is being developed into a major fisheries center. Currently, about 738 feet of berthing space with depths dredged to about 32¾ feet have been completed along the southern side. To the southeastward of New Harbor are Peetri and Seaplane harbors. Fishing Harbor, situated about 1/2 mile southeastward of Seaplane Harbor, is a small basin for fishing craft and is entered by a 10-foot dredged channel and has a depth of about 10 feet inside.

The remains of an old battery, showing above water, is situated about 600 yards northward of the entrance of Fishing Harbor. A light is shown on the battery. An area between Fishing Harbor and Seaplane Harbor, which vessels are prohibited from entering, is marked by a number of spar buoys. A spar buoy marking the outer end of a sewer is moored on the southern side of the channel close outside the south-southernmost entrance to Tallinn Harbor.

A light is shown from the head of the North Mole and from each end of the East Mole at the entrance to Tallinn Harbor. A fog signal is sounded from the head of the North Mole.

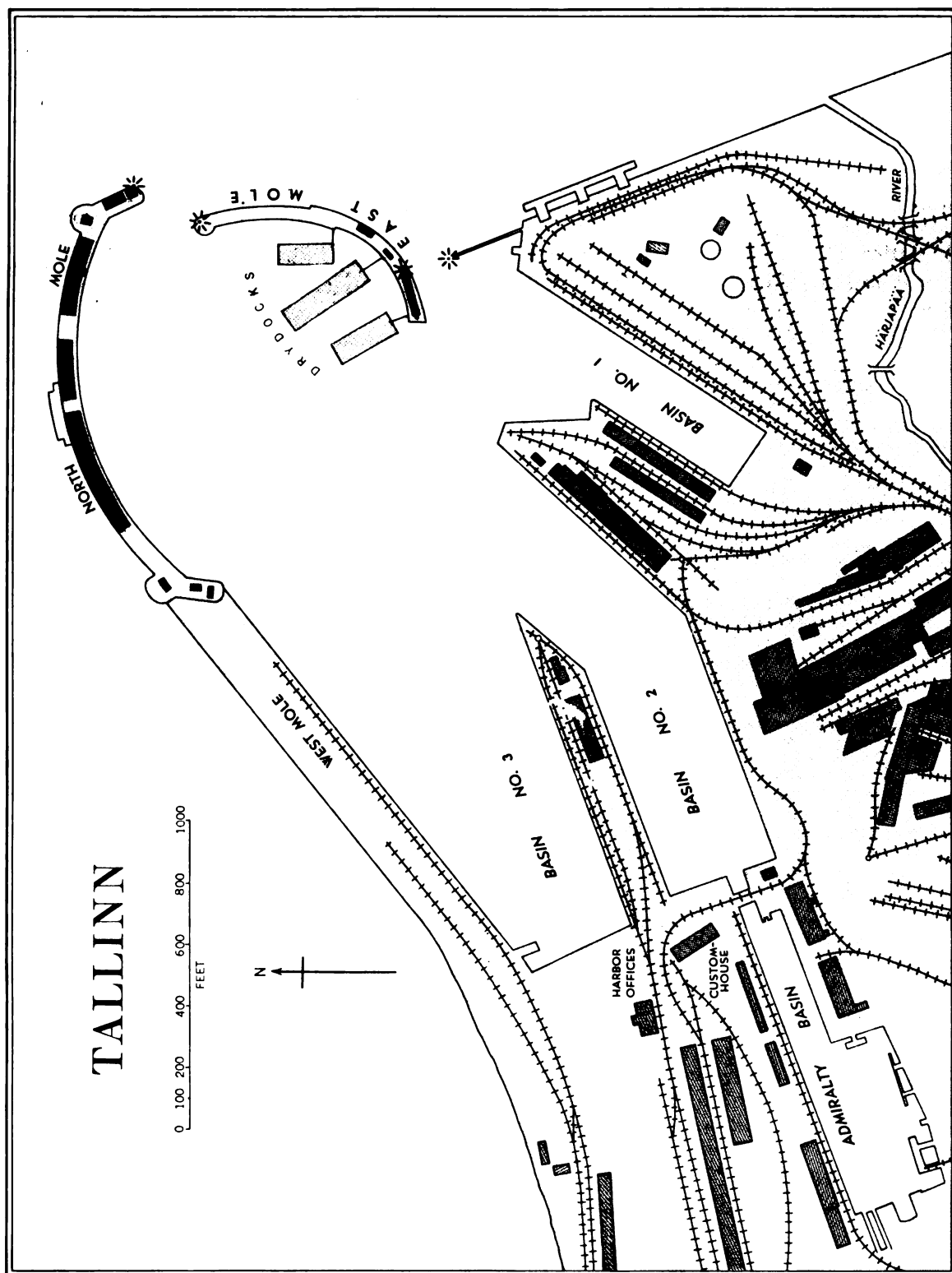
A light is shown from the southern side of the entrance to Number 1 Basin. A light is shown from the head of the mole on the north-western entrance to New Harbor and from the western end of the detached mole lying close southeastward. A light is shown on the eastern side of the entrance to Caravan Harbor and on each side of the entrance to Peetri and Seaplane Harbor. There is a signal station at the southwestern end of the No. 3 Basin and storm signals (sec. 1-15) are displayed from the mast; a tide gage is at the head of the basin.

PILOTS

2A-18 Pilotage is compulsory for all foreign vessels. Pilots board about 3 miles westward of Tallinna Medal Lighted Whistle Buoy. If unable to board due to weather; pilot vessel will lead ship into harbor.

DIRECTIONS

2A-19 Foreign vessels approaching Tallin may enter territorial waters between the meridians of 24°31' E. and 24°44' E. only. The lighted entrance range, bearing 159°, leads from pilot station into the harbor.



FACILITIES

2A-20 Tallinn, the capital and principal port of Estonia, had (1959) a population of about 280,000. The city is divided into several parts; the lower town where the commercial and manufacturing sections are located, Kesklinn, the central part, and the rocky heights of Dome Hill where the old citadel and government buildings are situated. The customhouse and harbor offices are located in the old harbor area.

Berths—Tallinn Harbor.—No. 1 Basin, with a total berthing length of about 1,950 feet, has depths of 29 to 36. No. 2 Basin has a total berthing length of about 3,050 feet, the larger quays having depths alongside of 29 to 36 feet. This basin leads into Admiralty Basin in which there is a depth of 18 feet and a total berthing length of about 2,575 feet. No. 3 Basin has a total berthing length of about 3,700 feet with West Mole, and depths of 18 to 49 feet alongside. The basin areas are served by the general railroad system with tracks laid down to all berths. There are 10 traveling electric portal cranes with a capacity of 1 1/2 to 3 tons, several traveling electric cranes of 3-ton capacity, a fixed 5-ton electric crane, 35 mobile cranes of from 5 to 10 tons capacity mounted on car trucks and about 6 floating cranes with a capacity of about 10 to 150 tons. There are six icebreakers, one of 6,500 horsepower capable of breaking ice of any thickness in the Baltic, and eight tugs of from 80 to 4,000 horsepower in the port.

Berths—New Harbor.—New Harbor has a total of over 4,300 feet of usable berthing space with depths of about 20 to 23 feet alongside.

Caravan Harbor, with depths of 18 to 32½ feet, has a total berthing length of 1,700 feet.

Supplies.—Fresh provisions are plentiful and coal and fuel oils may be obtained. Water is piped to the quays or procurable at the anchorage from a water boat.

Repairs.—Vessels can undergo repairs at Tallinn Harbor or at the shipyards in Teliskopli Laht (sec. 2A-10) where the northern yard has a number of cranes with lifting capacities of 3 to 10 tons, and the southern yard having a crane with a capacity of 100 tons.

Three floating drydocks, one with a lifting capacity to 9,500 tons, are in Tallinn Harbor. Diving equipment is available.

At Peetri Harbor there is a marine railway capable of taking a vessel of 300 tons. There is a depth of 18 to 32 feet alongside the quays. The yard here is connected to the general railroad system.

There is a marine railway at Admiralty Basin.

Communications.—There is railroad and telegraphic communication with all parts of Europe. Steamer service is maintained with other Baltic ports and the principal ports of Europe. There is air communication with Riga, Stockholm, and Helsinki. Radio communication is available.

Deratization.—See section 1-7.

Medical.—There are several hospitals that will admit seamen. For quarantine regulations see section 1-27.

ANCHORAGES

2A-21 Odensholm.—See section 2A-1.

Keibu Laht.—See section 2A-5.

Risti Nina.—See section 2A-5.

Paldiski.—See section 2A-6.

Lokhosal Laht.—See section 2A-8.

Naissaar.—See section 2A-9.

Tallinn Roads.—See section 2A-17.

Part B. ROKHONEM TO LETIPEA NEEM

2B-1 Rokhonem (Rohu Neem) (59°34' N., 24°48' E.), close southeastward of Grosholm, is the northernmost point of the peninsula forming the eastern shore of Tallinn Bay; it is fringed by foul ground up to about 600 yards offshore.

COAST-GENERAL

2B-2 The coast between Rokhonem and Letipea Neem, about 53½ miles eastward, trends very irregularly north-northeastward to Purikari Neem and thence south-south-eastward to Letipea Neem. The coast is indented by a number of bays and presents a variable aspect from seaward; from low, sandy, and bordered by woods, to steep cliffs and ridges and wooded inland hills. Foul ground fringes this coast and a good many rivers discharge into the gulf. A number of

off-lying islands, shoal banks, and patches are found in this area from close inshore up to 16 miles offshore.

DEPTHS—DANGERS—OFF-LYING BANKS AND ISLANDS

2B-3 NEW GROUND (Nygrund), with a least depth of 4.9 m (16 ft.) and marked on three sides by spar buoys and a light buoy on its southeastern side, lies about 4 3/4 miles northeastward of Lemika Point (sec. 2A-11).

DIVEL ROCK (Develsel), with a least depth of 2.1 m (7 ft.), lies about 7 miles north-northeastward of Lemika Point. It is marked on its northwestern, eastern, and southeastern sides by spar buoys. A light buoy is moored about 1/2 mile westward of the 2.1 m (7 ft.) patch. Lemika beacons, on the eastern side of Aegna Island, in range 203° lead close westward of Divel Rock and about 3/4 mile westward of New Ground.

KERI (59°42'N., 25°02'E.), a low islet, lies about 9 3/4 miles northeastward of Lemika Point. A small pier, with 0.9 m (3 ft.) alongside, lies on the southern side of the islet. A shoal area extends about 3/4 mile westward through west-northwestward, and about 1/2 mile southward through south-eastward from the islet. The northwestern and southern extremities are each marked by a SPAR BUOY.

A LIGHT is shown on Keri and a FOG SIGNAL is sounded. There is a SIGNAL STATION from which ice signals (sec. 1-15) are displayed. The lighthouse is connected by telephone with Tallinn. A submarine cable (sec. 1-34) is laid between Keri and Aegna Island and between Keri and Wrangel Island.

WRANGEL ISLAND (Prangli Saar), situated about 3 miles southward of Keri, is generally low and wooded, but has a small ridge on its northeastern side. At the northern end of the island there are two windmills, the northern being visible from the westward, and the southern from the eastward. Close

inland from the southern part of the island, is a chapel with a spire and a windmill close by, both of which are conspicuous from the southwestward. A LIGHT is shown on the northern extremity of Wrangel Island where there is a small pier. A motor LIFE-BOAT is maintained nearby. SPAR BUOYS mark the edge of the foul ground northward and northwestward, and a LIGHT BUOY marks the edge of the foul ground southward of the island. A shoal patch with a least depth of about 7.5 m (4 fms.), lies about 1 1/2 miles westward of the northwestern part of Wrangel Island. A spar buoy is moored on the western side of the shoal. A light is shown on the northwestern extremity of Wrangel Island. A light is shown on the southeastern extremity of the island.

KARPOVA (Korpovi Madalik), a shoal with a least depth of 1.8 m (6 ft.) and marked on each of its eastern and western sides by a spar buoy and on its northern side by a light buoy, lies about 3 1/2 miles south-southwestward of the southwestern extremity of Wrangel Island.

CAUTION.—Vessels are warned that gunnery and bombing practice from aircraft is carried out periodically in areas southward and southwestward of Wrangel Island and in Igosal Bay (sec. 2B-6).

LITTLE WRANGEL ISLAND (Aski Saar), about 11 1/4 miles southeastward of Wrangel Island, is fringed by rocks which extend about 3/4 mile northward and nearly 1/2 mile southeastward. There is a deep channel between Wrangel Island and Little Wrangel Island. A beacon stands on the southern extremity of the island.

2B-4 VAINDLÖ, a rocky islet 28 feet high, lies about 40 miles east-northeastward of Keri. The islet is fringed by rocks, and a reef, with a depth of 2.4 m (8 ft.) at its outer end, extends 1 3/4 miles south-southeastward; about 1/2 mile farther southward is Kako Matala (Kakumadal), with a depth of 1.8 m (6 ft.) and marked on its southern side by a spar buoy. The northern end of a reef extending from the northern side of the islet is also marked by a spar buoy.

A LIGHT is shown from the summit of Vaindlo and a FOG SIGNAL is sounded. There is a SIGNAL STATION at the light-house, which is connected to the general telephone system. Ice signals (sec. 1-15) are shown at this station.

STENSKARSKI (Stenskari), a 6.7 m (3 3/4 fms.) patch, lies about 3 miles southeastward of Vaindlo; a 9.1 m (5 fm.) patch lies about 4 1/4 miles south-southeastward of the islet.

NARGAEV BANK (Nagajevi), a rocky patch with a depth of 9.1 m (5 fms.), lies about 10 miles southwestward of Vaindlo light structure.

KALK GROUND (Kalkgrund), a shoal area about 1 mile in length and with a least depth of 0.3 m (1 ft.), lies about 1 1/4 miles south-eastward of Nargaev Bank. It is marked on its northern and southern sides by a spar buoy.

GOLYBKA (Tui Madalik), a shoal area with a least depth of 7.3 m (4 fms.), lies about 10 miles south-southwestward of Vaindlo.

SNAIG (Snjegi), a shoal patch with a least depth of 2.7 m (1 1/2 fms.), lies on an extensive bank about 6 1/2 miles south-southwestward of the light structure on Vaindlo. It is marked on its northern and southern sides by a spar buoy. A 8.2 m (4 1/2 fms.) patch lies about 1 1/2 miles southeastward and a 9.1 m (5 fm.) patch lies about 1 mile eastward of Snaig.

SELG GROUNDS (Selgrund), with a depth of 7.3 m (4 fms) lies about 4 1/2 miles southeastward of Snaig. Nine and one tenth meters (5 fms.) patches lie about 2 miles southeastward and 1 1/4 miles northwestward of Selg Grounds.

NORTH AND SOUTH HOFT (Pohja-Uhti and Louna-Uhti), two groups of barren islets lying about 9 miles south-southeastward of Vaindlo, are separated from each other by a channel about 1/2 mile wide and with a least depth of 5.5 m (3 fms.). North Hoft consists of two flat islets and several rocks about 8 feet high; on the southwestern side is a large white pinnacle rock which is conspicuous. Depths of less than 9.1 m (5 fms.) extend 2 miles northward from North Hoft. South Hoft is a group of three flat rocky islets surrounded by numerous large boulders. A light is shown on the larger islet of North Hoft.

Other coastal islands and dangers are described with the related area.

CAUTION.—Vessels are cautioned that gunnery and bombing practice from aircraft are carried out periodically in an area southward of Snaig.

PROHIBITED AREA.—See section 2A-8.

NAVIGATION

2B-5 From a position about 1 mile south of Keri Light (sec. 2B-3), a vessel intending to follow a coastal track in the Gulf of Finland may steer a course of 080° for about 23 miles to a position about 4 miles north of the light structure on Mohni Island (sec. 2B-10), thence a course of 089° for about 17 miles leads to a position about 4 miles south of the light on Vaindlo. These courses lead over depths of not less than 18.3 m (10 fms.).

COASTAL FEATURES—LANDMARKS

2B-6 BETWEEN ROKHONEM (sec. 2B-1) and Mindenemi Point the eastern side of the peninsula trends southeastward about 9 1/2 miles. The intervening coast is bordered by foul ground extending up to nearly 1 mile offshore.

IGOSAL BAY (Ihasalu Laht), is entered between Igosal Point (Ihasalu Nina) (59° 32' N., 25° 09' E.), about 10 1/2 miles east-southeastward of Rokhonem, and Mindenemi Point about 3 miles southwestward of Igosal Point. A reef, on which there are some above-water rocks, extends about 1 mile northwestward from Igosal Point; a SPAR BUOY marks its outer end. Two shoal patches, with depths of 8.5 and 6.4 m (4 3/4 and 3 1/2 fms.), lie about 1/2 and 3/4 mile farther west-northwestward. A light is shown on Igosal Point.

ULGASE is a settlement situated at the southwestern entrance point of Igosal Bay; a pier with depths of 3.9 m (13 ft.) alongside has a crane at its head. A railroad connects the pier with phosphorus mines about 1 1/4

miles inland. A conspicuous mill is situated about 1 1/4 miles southward of the point and at Joelahtme, about 3 3/4 miles south-southeastward, is a conspicuous church spire.

RAMO BAY (Kaberneeme Laht) is entered between Igosal Point and Ramo Island, about 3 miles northeastward. A reef, with a least depth of 0.9 m (3 ft.), extends about 1 1/4 miles northwestward from the head of the bay and is marked at its outer end by a spar buoy.

RAMO ISLAND (Rammusaar) is fringed by reefs which extend southeastward about 1 mile to Kobo Island (Koipsi Saar). This latter island is separated from the mainland by a narrow channel having a depth of 4.5 m (2 1/2 fms.) and marked by two spar buoys. The northern extremity of the reef extending from the northern side of Ramo Island is marked by a spar buoy. A motor lifeboat is maintained at the island. Anchorage may be had in a depth of 10 m (5 1/2 fms.), sand, about 1/2 mile southward of the island. A beacon stands on the southern side of the island.

KOLKO BAY is entered between Ramo Island and Juminda Point, about 9 miles northeastward. In the middle of the entrance are North Malos and South Malos Islands and at the head of the bay are Rogu Sari, situated about 1 1/2 miles southeastward of Kobo Island, and Peto-sari 1 1/2 miles eastward of Rogu Sari.

2B-7 NORTH MALOS AND SOUTH MALOS (Pohja-Malosisaar and Loyna-Malosisaar) are low, rocky islands surrounded by foul ground. They are separated by a reef, partly above water. A **BEACON** stands near the middle of South Malos. A reef, with a least depth of 0.4 m (1 1/2 ft.), extends about 1 1/4 miles southward from this latter island and is marked at its extremity by a spar buoy. A detached patch with depths of 1.2 to 6.4 m (3/4 to 3 1/2 fms.) and marked by a spar buoy exists about 2 miles southeastward of South Malos. A detached patch lies about 1 mile eastward of this patch and another about 1 1/2 miles southward.

ROGU SARI (Rohusaar) is a low islet encompassed by foul ground extending to the mainland. A **SPAR BUOY** marks the eastern extremity of the foul area. **PETO-SARI** (Pedasaar) is also surrounded by foul ground and a shallow sand shoal lies between it and the head of the bay. This island is densely wooded and is conspicuous from seaward. A **LIGHT** is shown at the head of Kolko Bay about 1 mile south-southwestward of Peto-sari.

JUMINDA POINT (Juminda Nina) has foul ground, with a depth of 5.5 m (3 fms.) at its outer end, extending nearly 1 mile northwestward from it. Two spar buoys are moored off the northern extremity of the foul area. A shoal with a depth of 10 m (5 1/2 fms.) lies about 2 1/2 miles west-southwestward of the point. A light is shown from Juminda Point; a lifeboat is maintained.

A light buoy moored about 4 3/4 miles west-northwestward of Juminda Point.

On the eastern shore of Kolko Bay, about 2 1/2 miles southward of Juminda Point, is **LEZA** (Leesi) church, conspicuous over the tops of the trees; **KOUZAL** (Kuusalu) church, 2 3/4 miles southward of the head of the bay, and **VALKIUL** (Valkla) mill and buildings, standing on the high coast about 3 3/4 miles northwestward of Kouzal church, are conspicuous. **TSITRE HARBOR**, in the south-eastern part of the bay, has a pier with 3 m (10 ft.) alongside, and about 750 feet westward is another small pier. There is regular steamer communication with Tallinn.

ANCHORAGE in Kolko Bay can be taken about 1 1/2 miles from the eastern shore and about 2 3/4 miles north-northwestward of the pier of Tsitre Harbor in depths of 24 to 35 m (13 to 19 fms.), sand and mud. Small vessels with local knowledge can anchor southwestward of Peto-sari in about 3.9 m (2 1/4 fms.); it is sheltered from all but northwesterly winds.

PAPON BAY (Hara Laht) is entered between Juminda Point and **PURIKARI NEEM**, about 6 miles east-northeastward, the latter point being the northern extremity of Perespe

Peninsula (Parispea Peninsula). A Lighted Buoy is moored about 3 miles east-northeastward of Juminda Point. A beacon stands on a point located about 1 mile southwestward of Purikari Neem. On the western side of the bay a range of hills extends the whole length of the Juminda Peninsula and form steep, wooded cliffs in places. There are several villages on the shores of the bay, the head of which is low. Between LOKSA, at the southeastern end of the bay, and OTTA KIVI, about 3 1/2 miles northward, the land is high; at the northern end of the peninsula are two hills.

A PROHIBITED AREA extends about 1 1/2 miles seaward along the western side of the Perespe Peninsula. All ships are forbidden to navigate within this area.

A shoal, with depths of less than 2 m (6 ft.) over it and with 6.4 m (3 1/2 fms.) at its outer end, extends about 1 1/2 miles north-northwestward from Purikari Neem. A 10.9 m (6 fm.) patch, marked by a spar buoy, lies in the middle of the entrance to Papon Bay about 3 miles west-southwestward of the cape. A 6.4 m (3 1/2 fm.) patch lies about 2 1/2 miles northwestward of Purikari Neem. A 10 m (5 1/2 fm.) patch has been reported about 2 1/2 miles northward of Purikari Neem.

HARRA ISLAND (Hara Saar), on which a light is shown, is 42 feet high, densely wooded, and fringed by rocks, lies close off the southwestern shore of Papon Bay to which it is connected by a drying reef used as a ford. On the western side of the island is a settlement, and the ruins of a pier extend from the southwestern side.

LOKSA

Position: 59° 35' N., 25° 42' E.

Depths: Anchorage, 7.3 to 3.5 m (4 to 19 fms.).

In entrance, 5.8 m (19 ft.)

At quays, 3.9 to 5.2 m (13 to 17 ft.).

2B-8 The port of Loksa, situated at the mouth of the Loksa River (Valge Jogi), is formed by two breakwaters. A SPAR BUOY is moored off the end of the southern breakwater.

NAVIGATION SEASON.—The port is gen-

erally closed from December 15 to April 15 due to ice conditions. For ice particulars see section 1-47 and consult the ice chartlets in chapter 1.

NAVIGATION.—Vessels bound for Loksa and having arrived at a position about 10 miles north of Aegna Island (sec. 2A-11) may steer a course of 102° for a distance of about 23 miles to a position about 2 miles north of Juminda Point. Thence a course of 136° for a distance of about 8 miles will lead to a position off the breakwater; or a course of 140° for about 6 1/2 miles to the anchorage.

WINDS AND TIDES.—The harbor has no tide, but easterly winds will cause a lowering of the harbor depths whereas westerly winds will increase the height of the water. The difference between highest and lowest water can amount to as much as 1.5 m (5 ft.). The berths at the quay become untenable during strong northerly winds and vessels must proceed to the anchor outside the breakwater.

DEPTHS.—The depths in the Papon Bay approach to the harbor are considerable, decreasing gradually as the port is neared. There is about 5.8 m (19 ft.) in the entrance at the breakwater and 3.9 to 5.2 m (13 to 17 ft.) alongside the quays. The harbor is subject to silting; depths are maintained by dredging.

LANDMARKS.—Conspicuous objects in the approach from seaward are a large rock on Purikari Neem, some isolated trees on Pahkel Neem, situated about 1 1/2 miles southwestward of the latter point, and some factory chimneys at Loksa.

LIGHT.—A light is shown on the western end of the northern breakwater at Loksa.

A lighted buoy is moored about 2 miles northwestward of the northern breakwater at Loksa and a spar buoy is moored about 1 mile north-northwestward of the breakwater.

HARBOR.—The harbor is entered between two breakwaters, the harbor master controlling the movement and berthing of vessels.

PILOTAGE is not compulsory and there are no government pilots available.

ANCHORAGES.—Large vessels can obtain anchorage in a depth of 35 m (19 fms.), clay and mud, about 1 1/2 miles west-northwestward of the light structure on the breakwater. Anchorage for small vessels can be taken off the western side of Harra Island in depths of 13 to 16 feet.

2B-9 LOKSA has over 1,000 feet of berthing space with 3.9 to 5.2 m (13 to 17 ft.) alongside. There is warehouse space of 3,800 square feet. The principal shipments through the port are wood products, wood pulp, bricks, and potatoes. There is a railroad on the quay. Repairs to small vessels may be accomplished. There is a slipway with a cradle having a length of 105 feet, draft on keel blocks at MHWS is 7 feet forward, 20 feet aft, lifting power 300 tons and a floating drydock about 200 feet long, 60 feet wide with a lifting capacity of 1,000 tons. Provisions and water in small quantities are obtainable. There is a customhouse in the town and post and telegraphic offices.

COASTAL FEATURES—LANDMARKS (CONTINUED)

2B-10 MONK BAY (Eru Laht) is entered between Purikari Neem, to the westward, and Mohni and the peninsula of which Polka Point is the extremity, to the eastward.

The western shore of the bay is wooded, the eastern is sandy, moderately high, and covered with woods, and the southern shore is low, and partly wooded. In the southwestern part of the bay the Loobu Jogi discharges. On the southern and western shores of the bay are several villages. A BEACON stands on a point on the western shore about 2 1/2 miles westward of Polka Point. At the head of the bay near the village of Kasikyu, there are two small piers for boats. Ilumae church, about 3 miles south-eastward of the head of the bay, is conspicuous. ANCHORAGE in the bay can be had in about 14.6 m (8 fms.), sand and mud, southward of a line joining Polka Point and Turbu Neem, 2 1/2 miles westward. Large vessels can anchor in about 21.9 m (12 fms.) between Mohni and Vinista, about 2 1/2 miles south-southwestward, but they are exposed to northerly winds. Anchorage is afforded in about 20.1 m (11 fms.), about 2 miles southward of Polka Point and 3/4 mile from the eastern shore. A lifeboat is maintained at Perespe, on the southeastern side of Purikari Neem.

MOHNI (Mohnisaar), an island lying about 3 miles eastward of Purikari Neem, has a stone embankment along the southwestern coast. There is a 29-foot hill on the northern side of the island. A light is shown on the northern end of Mohni; a RADIOBEACON transmits and a fog signal is sounded from the light structure. There is a SIGNAL STATION from which ice signals (sec. 1-15) are displayed. A submarine cable (sec. 1-34) is laid between Mohni and the mainland southwestward. There is a boat pier near the lighthouse and another on the northeastern side of the island.

A shoal, with 1.3 m (4 ft.) at its outer end, extends about 700 yards northwestward from the northwestern end of the island and is marked by a spar buoy. A reef extends about the same distance from the southeastern end of the island and has a depth of 2.7 m (1 1/2 fms.) at the outer end and is marked by a spar buoy. A shoal, with a depth of 2.7 m (1 1/2 fms.) and marked on its northern side by a spar buoy, lies about 1 mile southeastward of the southeastern end of the island. Between this shoal and Polka Point there are several shoals with depths of 3.6 to 5.5 m (2 to 3 fms.), a 9.1 m (5 fm.) patch lies 1 mile southwestward of the southeastern point of Mohni, and another 9.1 m (5 fm.) patch lies about 1 1/2 miles southward of the same point. Altipae Saar is situated close off the western shore of Monk Bay about 3 1/4 miles south-southeastward of Purikari Neem.

2B-11 KASPER BAY (Kasmu Laht) is separated from Monk Bay by Kasper Peninsula (Kasmu Peninsula), which is rocky and wooded; the shores of the bay are sandy and stony. The southern shore is low, and visible on a steep hill, about 3 miles inland, is the village of ILUMAE with a conspicuous white church. At the mouth of the Vezu Jogi, near the southeastern part of the bay, is the village of VEZU (Vosu) with a conspicuous chimney. A 525-foot pier is located here and there is a POST AND TELEGRAPH OFFICE.

The village of KASPER (Kasmu) situated on the eastern side of the peninsula, has a small harbor. The village is connected to the

general railroad system and there is steamer communication with Tallinn during the summer. There is a post and telegraph office. A LIGHT is shown at Kasper and STORM SIGNALS (sec. 1-15) are displayed; the light structure is connected by telephone with Tallinn. ANCHORAGE can be had in about 14.6 m (8 fms.), mud and clay, eastward of the light structure. Small vessels can anchor about 3/4 mile south-southeastward of the light, where there is good shelter. Foul ground, on which are three low islets, the largest of which is wooded, extends about 1 1/2 miles northward from the northeastern point of the Kasper Peninsula. A spar buoy marks the outer end of the foul area.

LOPI POINT (Lovineem), the eastern entrance point of Kasper Bay, is rocky; some distance inland it is wooded. A beacon stands on its extremity. A shoal, with 4.5 m (2 1/2 fms.) and marked at its outer end by a spar buoy, extends 1 1/4 miles northward from Lopi Point. Dangerous wrecks lie on the western edge of the shoal; about 1 1/4 miles north-northwestward and about 3/4 of a mile westward of Lopi Point.

DIRECTIONS FOR KASPER BAY.—From a position 1 mile north of Mohni (sec. 2B-10), vessels bound for Kasper Bay steer 126° for about 5 1/2 miles until the light structure at Kasper in line with a light on ILUMAE church bears 192°; thence steer on this range until the northern point of the large islet on the western side of the entrance is abeam, then steer 179° to the anchorage.

2B-12 PETOSAR POINT (Pedassaare-neem) (59° 38' N., 26° 04' E.), about 3 miles eastward of Lopi Point, is a narrow projection extending about 3/4 mile northeastward. The bight between them is encumbered with shoals, and depths of less than 5.5 m (3 fms.) encompass the point. Spar buoys mark the edge of the shorebank northeastward and east-southeastward of the point.

VERKI HARBOR (Vergi), entered between Verki Neem, about 2 miles southeastward of Petosar Point, and the mainland to the southward, has a least depth of 3.9 m (13 ft.); the approach is marked by a pair of lights in

range 262°, and a pair of beacons in range 358°. About 200 yards eastward of Verki Neem is Verki Saar, from which a reef extends about 200 yards southwestward. The harbor is open to easterly winds, but near the southern side of the islet there is shelter from all winds. A light is shown on Verki Saar.

Vessels should approach Verki Harbor with the range lights in line 262° until abreast the SPAR BUOY moored about 200 yards south-southwestward of the head of the mole, thence keep the range beacons in line (358°), which leads through the 240-foot wide dredged channel to the ANCHORAGE.

The village of ALTIA (Altja) is located about 1 mile southward of the light structure on Verki Saar; about 2 miles eastward of the light a SPAR BUOY marks the northeastern side of a 7.3 m (4 fm.) shoal area.

VAINOPE POINT (Vainupea), lying about 5 miles eastward of Altia, has a conspicuous white church with a red spire, and on the coast, westward of the church, is a sandy ridge about 1 mile long. A LIGHT is shown on Vainope Point. A shoal extends about 3/4 mile northwestward of Vainope Point. Between Vainope Point and TOOLSE NEEM, 6 1/2 miles east-southeastward, are conspicuous white sand hills. On Toolse Neem are the conspicuous ruins of a house. Large rocks, some above and others below water, lie off the northwestern side of the point. Close westward of them are the remains of a breakwater, with a depth of 3 m (10 ft.) behind it, where small craft may obtain shelter from southerly and easterly winds.

KUNDA LAHT, entered between Toolse Neem (59° 32' N., 26° 28' E.) and LETIPEA NEEM about 3 1/4 miles east-northeastward, is sheltered from southerly and easterly winds. The eastern and southern shores are low and consist of meadows and swamps, with some wooded areas. About 1 mile southward of the bay are steep ridges through which the Kunda Jogi flows into the bay. The chimneys of the cement works are conspicuous, being located on high ground about 1 1/2

miles inland. A LIGHT is shown at the head of the bay; the lighthouse is connected to the general telephone system. Conspicuous objects are Malla windmill from which a LIGHT is shown, located about 1 1/2 miles southeastward of Kunda Light, and the mill at the village of Illia, about 2 miles farther southeastward. The town of KUNDA, situated about 1 mile up the river, is connected to the general railroad system; there is a post and telegraph office. A SUBMARINE CABLE (sec. 1-34) is laid between Vaindlo (sec. 2B-4) and Kunda.

Kunda Laht is an open roadstead, wide and shallow. On the western side of the bay is a rocky ledge extending 2 miles northward from the coast and marked on its northeastern side by a SPAR BUOY; other sunken rocks extend about 1 mile north-northwestward from the northern extremity of the ledge and are marked at their outer end by a SPAR BUOY. During high water periods the greater part of the foul area on both sides of the bay is covered. Near the mouth of the Kunda Jogi are a number of rocks partly above water; a SPAR BUOY is moored close northward of the rocks. In the eastern part of the bay the depths are more uniform, and small vessels are able to approach within 3/4 mile of the shore and anchor.

2B-13 Vessels approaching Kunda Laht from the westward may, from a position 1 mile north of Mohni (sec. 2B-10), steer 110° for about 23 1/4 miles until the light structure at the head of the bay bears 167°. Thence steer this course for the anchorage which is located about midway between the buoys marking the reefs on either side of the bay, in 12.8 to 14.6 m (7 to 8 fms.), sand. Smaller vessels can find anchorage in a depth of about 8.2 m (4 1/2 fms.), mud and sand, about 1 mile north-northeastward of Kunda

Light and about 600 yards eastward of the line of approach. The loading and discharging is accomplished by lighters at the anchorage. Kunda Sadam, at the head of the bay, is formed by two miles, the west mole having a depth of 2.1 m (7 ft.) at its head; an electric crane is available.

ANCHORAGES

2B-14 IGOSAL BAY.—See section 2B-6.

KOLKO BAY.—See section 2B-7.

LOKSA SADAM.—See section 2B-8.

MONK BAY.—See section 2B-10.

KASPER BAY.—See section 2B-11.

VERKI SADAM.—See section 2B-12.

KUNDA LAHT.—See section 2B-13.

PART C. LETIPEA NEEM TO OSTROV KARAVALDAY

2C-1 LETIPEA NEEM (59° 33' N., 26° 35' E.) is encompassed by foul ground, which is marked at its northern extremity by a SPAR BUOY moored about 1 1/4 miles north-northeastward of the cape and by another SPAR BUOY moored at its northwestern edge about 1/2 mile north-northwestward of the cape. A LIGHT is shown at Letipea about 1 mile eastward of Letipea Neem. A LIFEBOAT is maintained near the lighthouse.

COAST—GENERAL

2C-2 The coast between Letipea Neem and Ostrov Karavaldy, about 80 miles east-northeastward, trends very irregularly eastward to Narva Joesu, thence northward to Kurgalski Point, and thence east-northeastward to Ostrov Karavaldy. The coast is indented by several large bays and presents a variety of aspect from seaward; from low, rocky, and wooded, interspersed with meadow and marshy ground, to steep stone cliffs and

partially wooded hills with elevations up to 490 feet. Foul ground fringes this coast, and several large rivers discharge into the gulf. A number of off-lying islands and an extensive area of reefs, shoal banks, and patches lie seaward of this part of the coast.

CAUTION.—A prohibited area, marked by buoys, with a breadth of about 11 miles lies in a west-southwesterly direction between Ostrov Lavensaari and Iso Tytarsaari.

Traffic separation lanes have been established in the routes leading to Viborg and Leningrad and can best be seen on the chart

DEPTH S—DANGERS—OFF-LYING BANKS AND ISLANDS

2C-3 RODIONOVA (Radionovi), a 6.7 m (3 3/4 fm.) patch, lies about 5 1/2 miles north-northeastward of Letipea light structure. Diomed (Diomidi) and Baraban (Barabanovi), shoal patches, each with 4.5 m (2 1/2 fms.), lie on an extensive bank about 7 and 8 1/2 miles, respectively, northeastward of the light. A spar buoy is moored southward of Diomed. Baraban is marked on its northern side by two spar buoys.

SEKSTAN (Sekstani), a rock, is charted about 7 1/2 miles northeastward of the light structure on Vaindlo (sec. 2B-4), but both its position and existence are doubtful.

RUUSKERI (RODSKAR) (Ostrov Redskyar) (59°58'N., 26°41'E.), about 13 1/2 miles northeastward of Vaindlo, is a rocky islet surrounded by a reef, the northern extremity of which is marked by a spar buoy. A light is shown on Ruuskeri and a fog signal is sounded from the light structure.

A bank with a least depth of 13.7 m (7 1/2 fms.) is located about 3 3/4 miles northwestward of Ruuskeri. Another bank with a least depth of 16.7 m (9 1/4 fms.) is located about 4 miles northward of Ruuskeri.

2C-4 OSTROV SUR-SARI (Ostrov Suurkelli), 554 feet high and partially wooded, lies about 9 1/2 miles east-northeastward of Ruuskeri. The island is steep-to, but a reef extends about 300 yards from its northern extremity. A shoal patch, having a depth of 6.4 m (3 1/2 fms.) and marked on its western side by a spar buoy, lies about 800 yards northwestward of the northern extremity of the island. Banka Sursarenmatala, a detached 7.3 m (4 fm.) shoal marked on its southern side by a spar buoy, lies about 2 miles northwestward and a buoy with a radar reflector lies about 4 miles east-northeastward of the same extremity.

A **BEACON** is located on the northern end of Ostrov Sur-Sari. **STORM SIGNALS** (sec. 1-16) are displayed near the beacon. A **LIGHT** is shown a little over 1/2 mile southward of the beacon.

There are two villages on the eastern side of the island; Suurkyla, the northern, stands at the head of a small bay. A **LIGHT** is shown on the head of a mole at Suurkyla. Between the two villages, and about 400 yards offshore, there are two rocks; Surgelli, the northern, is above water and the other, with a depth of 4.5 m (2 1/2 fms.), lies about 1/2 mile northward of the southernmost village.

Anchorage during easterly winds can be taken in depths of 37 to 55 m (20 to 30 fms.) on the western side of Ostrov Sur-Sari, about 1 mile offshore, but the holding ground is not too good. Better anchorage can be found on the eastern side of the island between Surgelli and the village of Suurkyla, about 3/4 mile offshore in depths of 24 to 29 m (13 to 16 fms.), mud, deepening quickly to 50 m (27 fms.) a short distance eastward. Small vessels can anchor in 3.7 to 5.5 m (2 to 3 fms.) in the bay close southward of Suurkyla, but it is exposed to easterly winds. An irregularly shaped area prohibiting fishing and anchoring, extends eastward from Ostrov Sur-Sari for a distance of about 15 miles. A whitewashed rock in range (234°) with a pole on a white rock leads into the bay. A light is shown from the southernmost point of Ostrov Sur-Sari, and a fog signal is sounded from the lighthouse. A radiobeacon transmits from the lighthouse.

WRECKS.—Two dangerous wrecks lie about 1/2 mile and 2 miles southwestward and northwestward, respectively, of the light on the southernmost point of the island.

MORDVINOVA, about 8 miles eastward of the northern end of Ostrov Sur-Sari, consists of two 9.1 m (5 fm.) patches about 1/2 mile apart. The southern patch is marked by a spar buoy on its southwestern side. The north side of the northern patch is marked by a spar buoy.

ABNORMAL MAGNETIC VARIATION was reported (1927) to exist in an area about 7 miles eastward of the southern half of Ostrov Sur-Sari.

VIRGIN ISLETS (Severnny Virgin and Yushnyy Virgin), about 5 1/2 miles southwestward of Ostrov Sur-Sari, are two rocky islets, about 1 mile apart, fringed by reefs and separated by a narrow channel having a depth of 9.1 m (5 fms.). A light (59° 57'N., 26°52'E.) stands on the northern islet.

LEBIADNI (Yuzhnaya Lebyadnikova), a shoal patch with a depth of 4.5 m (2 1/2 fms.), lies about 2 1/2 miles west-southwestward of the southernmost of the Virgin Islets.

A 12.8 m (7 fm.) patch lies about 1 mile westward of the northern end of Lebiadni.

VIKALLA, a reef with some above-water rocks, lies about 6 1/4 miles southward of Ostrov Sur-Sari and is marked by a lighted buoy and a spar buoy. A 10 m (5 1/2 fm.) patch lies almost 4 miles eastward of Vikalla.

Virgin Beacon in range 284° with Ruuskeri lighthouse leads close northward of the 10 m (5 1/2 fm.) patch and Vikalla and close southward of the 4.9 m (2 3/4 fm.) patch.

2C-5 PIEN TYTARSAARI (OSTROV TIYEN TYUTERSARD (Little Tyters), about 11 1/2 miles southward of Ostrov Sur-Sari, is low, sandy and fringed by rocks. A shoal, with depths of less than 10.9 m (6 fms.), extends about 2 3/4 miles from the southeastern point and a 5.5 m (3 fm.) patch at the southern extremity of the shoal is marked by a spar buoy. A rock above water lies about 1 mile west-southwestward of the southeastern point.

ISO TYTARSAARI (Great Tyters) (Ostrov (Bol'shoy Tyutersari) (59°51'N., 27°11'E.), about 7 miles east-northeastward of Pien Tytarsaari, is moderately high, densely wooded, and has a village, with a church, situated on its southern side. A shoal, with depths of less than 10.9 m (6 fms.), extends about 2 1/4 miles south-southeastward from the southeastern side of the island. Ulko, a shoal patch with a depth of 5.8 m (19 ft.), lies at the outer end of the shoal area just mentioned. A 5.5 m (3 fm.) patch lies about 1/2 mile off the northeastern side of the island. A light is shown on the summit of Iso Tytarsaari. Lights in range 039° are exhibited at the southern end of the island. A motor lifeboat is kept at the island.

A dangerous WRECK, the position of which is doubtful, lies about 13 1/2 miles northeastward of Iso Tytarsaari.

NEW GROUND (Neugrund), a shoal area about 5 1/2 miles south-southeastward of Iso Tytarsaari, has a least depth of 1.3 m (4 1/2 ft.). It is marked by a lighted buoy,

moored eastward of the shoal area, and by spar buoys.

Namsi Bank is an extensive shoal, with a least depth of 0.4 m (1 1/2 ft.), situated about 11 1/2 miles southeastward of Iso Tytarsaari. It is marked by a lighted buoy and by spar buoys; the western buoy marks the western side of a 8.2 m (4 1/2 fms.) patch.

VIGRUND, about 15 1/2 miles east-southeastward of Iso Tytarsaari, is an islet lying on a rocky bank; foul ground extends about 1 3/4 miles northward. A light is shown on Vigrund. Between Vigrund and Kiskolski Reef, which extends from the eastern side of Narva Laht (sec. 2C-11), there is a channel, about 1 mile wide, with a least depth of about 7.3 m (4 fms.); it is marked by a lighted buoy and by spar buoys.

Two detached patches of 10 to 10.9 m (5 1/2 to 6 fms.) lie about 4 1/4 miles northwestward of Vidgrund Light. A submerged obstruction exists about 2 1/4 miles northeastward of Vigrund Light.

2C-6 SOMMARS (Someri) (Ostrov Bol'shoy Sommers) (60°13'N., 27°39'E.), nearly 21 miles east-northeastward of the northern extremity of Ostrov Sur-Sari, is an island 50 feet high, on the northern side of which there is a small bay with a depth of 9.1 m (5 fms.), mud, near the middle. A small reef extends about 150 yards southeastward from the western side of the entrance of the bay, and a shoal, with a depth of 2 fathoms, lies about 200 yards northward of the western entrance point. A beacon stands on the eastern entrance point. A light is shown on the western hill of Sommars. A fog signal is sounded from the western side of Sommars. Several small buildings stand in the center of the island.

The eastern side of the island is fringed by a narrow reef, and several rocks with 3.6 m (2 fms.) and less, lie within 600 yards of the southern side of the island. A shoal, with 6.7 m (3 3/4 fms.), lies less than 1/2 mile eastward, and a 8.2 m (4 1/2 fms.) patch is about 1 mile north-northeastward of the lighthouse on Sommars. A Lighted Buoy lies about 4 miles east-southeastward of the lighthouse. A seal rookery has been established northward of Sommars. The area is marked by buoys. See section 3D-5.

LITTLE SOMMARS (Pien Šomeri) (Ostro Mali Sommars), a rock 4 feet high, lies about 2/3 mile eastward of Sommars.

NARVI (60° 15' N., 27° 58' E.), an islet, is situated about 9 1/2 miles east-northeastward of Sommars; a **LIGHT** is shown and a **FOG SIGNAL** is sounded from the light structure.

An **AMMUNITION DUMPING GROUND** is centered about 2 1/4 miles northward of Narvi; the area is circular with a diameter of about 1 mile.

REBININA (Banka Ryabinina), a shoal with a depth of 7.3 m (4 fms.), lies about 4 miles eastward of Narvi; about 5 miles farther eastward is Nestor Ground (Banka Nestor), a shoal patch with a depth of 7.6 m (4 1/4 fms.). A 7.3 m (4 fm.) patch lies about 700 yards north-northwestward of Nestor Ground and a 11.9 m (6 1/2 fm.) shoal lies about 1 mile east-northeastward of Nestor Ground.

SREDNIA (Banka Srednyaya), about 3 1/2 miles south-southeastward of Nestor Ground, has a least depth of 6.7 m (3 3/4 fms.), and is marked on its southern side by a light buoy. A 6.4 m (3 1/2 fms.) patch lies about 3/4 mile northward of Srednia. Two shoals, with a depth of 11.9 m (6 1/2 fms.), the positions of which are doubtful, lie 2 1/2 miles south-southeastward and 3 3/4 miles east-southeastward of Srednia. A 10 m (5 1/2 fm.) patch lies about 4 1/2 miles south-southeastward of Srednia. Dangerous wrecks lie about 2 3/4 miles north-northeastward and 2 3/4 miles southeastward of Srednia. A 11.3 m (37 ft.) spot lies 2 miles southwestward of Srednia.

AGAMEMNON, a shoal area with a general depth of 18.3 m (10 fms.) but with a 8.2 m (4 1/2 fm.) patch at its southern extremity and a 9.1 m (5 fm.) patch near its eastern side, lies about 6 miles eastward of Srednia. A spar buoy is moored south of the 8.2 m (4 1/2 fm.) patch. Two 11.9 m (6 1/2 fm.) patches lie about 1 1/4 and 2 1/2 miles north-eastward of Agamemnon. Banka Udornik, an unmarked 9.1 m (5 fm.) patch is charted about 3 miles southward of Agamemnon.

LAVENSARSKIA (Banka Lavensarskiy), a shoal area with a least depth of 3.6 m (12 ft.), lies about 8 miles southeastward of Sommars. A shoal with a depth of 3.6 m (2 fms.), lies about 3/4 mile southward of Lavensarskia. A lighted whistle buoy with radar reflector is moored about 1/2 mile northward of Lavensarskia.

METEOR, a shoal with a least depth of 4.5 m (2 1/2 fms.), lies about 2 miles south-eastward of Lavensarskia and is marked on its northern side by a spar buoy. A wreck lies about 1 1/2 miles east-southeastward of Meteor.

LESPEKER MATALA, with a least depth of 4.9 m (2 3/4 fms.), lies about 2 3/4 miles southeastward of Meteor. Shpartenkova, a shoal with a least depth of 4.5 m (2 1/2 fms.) lies about 3 miles, southward of Meteor. Range lights, bearing about 244°, are shown at the head of a cove on the northeastern end of Ostrov Lavensaari.

2C-7 OSTROV LAVENSAARI AND PENI-SARI, about 23 and 28 1/2 miles eastward of Ostrov Sur-Sari, respectively, are separated from the northern end of Kurgalski Reef (sec. 2C-8) by a channel about 600 yards wide, on either side of which are numerous rocks and shoals. Ostrov Lavensaari, the western island, is moderately high, wooded, and surrounded reefs which extend over 3 miles from its southern side; **SOUI-SARI**, the eastern part of the island, is connected to the main part of the island by a narrow isthmus. A **LIGHT** is shown on the northern extremity of Ostrov Lavensaari. **RANGE LIGHTS** in line 284 1/2° are shown on Soui-sari and lead southward of Peni-sari. A light is shown on the southern extremity of Soui-sari and on a small island 1 mile southward of the southern extremity of Ostro Lavensaari.

STORM SIGNALS (sec. 1-16) are displayed at the northern end of Ostrov Lavensaari.

An obstruction lies about 2 miles north-westward of the northern light on Ostrov Lavensaari.

ANCHORAGE can be taken in **NORE KAPEL LAHTI**, located about $3/4$ mile northward of the isthmus connecting Soui-sari with the main part of Ostrov Lavensaari, in depths of $4\frac{1}{2}$ to 8 fathoms, fine sand, but exposed to northerly winds. A **LIGHT** is shown from the head of a pier on the western shore of Nore Kapel Lahti about $1\frac{1}{2}$ miles southeastward of the northern extremity of Ostrov Lavensaari. An irregularly shaped area prohibiting fishing and anchoring extends in a northwestwardly directions from O Lavensaari to Sommars.

MALMIGET LAHTI, situated immediately northwestward of Nore Kapel Lahti, affords limited **ANCHORAGE** for small vessels in depths of 3 to $3\frac{1}{2}$ fathoms. There is a village at the head of the bay. The bay is entered northward of a shoal extending from Musta-niemi, the southern entrance point of the bay. **TINSKMATALA**, with a depth of $1\frac{1}{2}$ feet and lying on the northern side of the entrance, is marked by **SPAR BUOYS** on its eastern and southern sides. **ELENA-MATALA**, with a depth of 2 feet, lies near the anchorage and southward of the line of the range lights shown at the head of Malmiget Lahti.

VIKAR-MATALA, with a depth of 4 fathoms, lies $1\frac{1}{4}$ miles southwestward of Ostrov Lavensaari; foul ground extends about $1\frac{3}{4}$ miles southward from the southern extremity of the island. A **WRECK** lies sunk about 3 miles southward of the southern point of Ostrov Lavensaari.

MITU-MATALA, a rocky patch with a depth of 3 feet, lies about $1\frac{1}{2}$ miles south-southwestward of the southern extremity of Soui-sari and is marked on its western side by a **SPAR BUOY**. A **SPAR BUOY** marks the southern edge of the shoal area which extends about 2 miles southward of Mitu-matala. A **SPAR BUOY** is moored at the southern end of **RIVI-MATALA**, about $3\frac{1}{2}$ miles southward of the southern extremity of Soui-sari, and one on its eastern side.

ROUS-MATALA (Banka Rusmatala), with a

least depth of 2 feet and marked by **SPAR BUOYS** lies about $5\frac{1}{2}$ miles southward of Soui-sari.

KHAILODA (Kamni Khayloda) ($59^{\circ} 56' N.$, $27^{\circ} 59' E.$), a foul area with above-water rocks, is situated about $3\frac{1}{2}$ miles southeastward of the southern extremity of Soui-sari. A **LIGHT** marks the center of the area and **SPAR BUOYS** mark the four sides. The channel which passes between Khailoda and the northwestern extremity of Kurgalski Reef is marked by **SPAR BUOYS**. A **LIGHT BUOY** is moored at the northeastern end of this channel.

CURRENT.—In the passage between Khailoda and Kurgalski Reef, in calm weather, there is usually a weak southwesterly current; at other times the direction and velocity depend on the wind.

2C-8 PENI-SARI is low and nearly surrounded by reefs. The eastern and western parts of the island are joined by a sandy isthmus, 13 feet high. The northern point is formed by a low spit covered with stones, and on the northeastern point there are fishermen's huts. Two small grassy islets lie close off the northern point. A **LIGHT** is shown on Peni-sari about $2/3$ mile southward of the northern extremity of the island. A $2\frac{1}{2}$ -fathom patch lies about 2 miles southward of the light structure on Peni-sari. A **LIGHT BUOY** is moored about $2\frac{1}{4}$ miles northwestward of the light structure on Peni-sari and marks Lus-matala, a 4-foot patch, which lies on the northwestern edge of the shoal which extends from the island.

KURGALSKI REEF, on which there are several above-water rocks, extends about 9 miles northward from Kurgalski Point (sec. 2C-14) and is steep-to, especially on its eastern side. The northern end of the reef is marked by a lighted whistle buoy and the northwestern side by three **SPAR BUOYS**. These buoys mark the eastern side of the

channel, between Khailoda and Kurgalski Reef, which has a least depth of 10 fathoms. Spar buoys mark the eastern side of this reef.

Samod (Banki Samoyed), a shoal marked by a buoy, with a depth of 22 feet, lies about 9 1/2 miles south-southeastward of the southeastern extremity of Peni-sari.

2C-9 OSTROV SEYSKARI (60° 02' N., 28° 23' E.), situated about 9 miles eastward of Peni-sari, is low, densely wooded, and surrounded by reefs, which extend nearly 4 miles westward and on which are numerous islets and rocks. A quadrangular **ZONE PROHIBITED TO ALL VESSELS** occupies almost entirely the navigable area between Ostrov Seyskari and Peni-sari. **GARKALA-MATALA**, a 17-foot patch about 2 miles south-southeastward of the southern extremity of the island, is marked by a spar buoy. A 17-foot patch about 1 1/2 miles south-southeastward of the southern extremity of Ostro Seyskari is also marked by a spar buoy. A lighted whistle buoy is moored about 2 3/4 miles eastward of the northeastern point of the island. On the western side of the island are several villages; a channel dredged to 6 feet and marked by **BUOYS**, leads to Seyskari Harbor. Lights are shown on the northern and southeastern sides of Ostrov Seyskari. A landing pier for boats is situated near the light on the northern end of the island; vessels of 9-foot draft can approach within

600 yards of this pier. A **FOG SIGNAL** is sounded from the light structure at the northern end of the island. Anchorage can be taken off the eastern side of the island in 12 to 14 fathoms, mud, sheltered from westerly winds. A beacon stands about 1 3/4 miles northwestward of the light structure on the northern end of Ostrov Seyskari. This beacon is frequently destroyed by ice.

NAGAEVA (Banka Nagayeva), about 5 1/2 miles northwestward of the lighthouse on the northern side of Ostrov Seyskari, has a depth of 4 1/4 fathoms and is marked on its northern side by a **LIGHTED WHISTLE BUOY** with a **RADAR REFLECTOR**.

A 5 1/2-fathom shoal lies about 4 1/2 miles northward of the northern end of Ostrov Seyskari.

A **BEACON** stands on Kokor, an islet situated nearly 1 1/2 miles westward of Ostrov Seyskari. **SUBRITINT-MATALA**, with a depth of 3 fathoms, lies about 4 miles westward of Kokor.

KISELEVA, about 5 3/4 miles west-southwestward of the southern extremity of Ostrov Seyskari, has a depth of 4 3/4 fathoms.

VELI-MATALA, on which there are some rocks that dry, lies about 5 to 7 miles south-southeastward of Ostrov Seyskari; spar buoys mark the eastern, southern and western sides of the shoal.

DIAMOND (DEMANSTEINSKIE) BANK (Banka Demansteyskaye) situated about 9 miles east-southeastward of the southeastern extremity of Ostrov Seyskari, has three rocky patches, the

southernmost of which has a depth of 0.4 m (1 1/2 ft.), the northern 5.5 m (3 fms.), and the western 4.9 m (2 3/4 fms.). The bank is marked on each of its four sides by a spar buoy.

KLYUZ, a 8.2 m (4 1/2 fm.) shoal, lies about 3 miles south-southwestward of the southernmost rocky patch of Diamond Bank.

Two shoal patches, Provodnik and Zapal (Banka Zala), with depths of 10.9 and 8.2 m (6 and 4 1/2 fms.), respectively, lie about 3 1/4 miles south-southeastward and 4 3/4 miles southward of the southernmost rocky patch on Diamond Bank.

Zmei (Banka Zmey) a shoal with a depth of 8.5 m (4 3/4 fms.) lies about 3 1/4 miles eastward of the northernmost rocky patch on Diamond Bank.

Other dangers, lying closer inshore, are described with the related coastal features.

NAVIGATION

2C-10 From a position about 4 miles south of Vaindlo Light structure (sec. 2B-4) the inshore track leads east-northeastward on a course of 062 1/2° for about 22 1/4 miles to a position 5 1/2 miles southward of the southern extremity of Ostrov Sur-Sari (sec. 2C-4); thence a course of 053° for about 24 miles leads to a position 3 miles southward of Sommars Light passing northward of the spar buoy moored off the northern end of Vikalla (sec. 2C-4). Thence a course of 099° may be steered to a position about 1/2 mile northward of Nagaeva Bank light buoy, then change course southeastward for No. 1 lighted whistle buoy, distant about 8 1/2 miles. Proceed on the Ostrov Seyskari radio range steering 090 1/2° for light buoys Nos. 2 and 3 and the pilot station at Leningrad Approach Light Buoy.

COASTAL FEATURES—LANDMARKS

2C-11 Narva Laht lies between Kunda Laht (sec. 2B-12) and Kurgalski Point, about

48 miles east-northeastward. The shores are mostly sandy and backed by sand dunes and woods. There are depths of 18.3 to 55m (10 to 30 fms.) in the bay, decreasing gradually toward the shore.

Magnetic disturbance.—Areas of magnetic disturbance are located near the central part of Narva Laht, about 17 miles west-northwestward of the Narva Jõgi entrance, and near the southern part of Narva Laht, about 10 miles westward of the Narva Jõgi entrance.

Mahu Sadam (59°31' N., 26°44' E.), situated about 5 miles east-southeastward of Letipea Neem, is formed by a breakwater about 230 feet in length. It affords shelter from northerly winds in a depth of 3m (10 ft.). A light is shown on the western end of the breakwater and close southward of the light structure is a beacon. These structures in range bear 183 1/2°.

Conspicuous objects in this area are the coast guard house on the promontory on the eastern side of the harbor, Iila Küla, with a windmill, about 2 3/4 miles southwestward of the light structure, the tower of the church at Nigula, 4 1/2 miles southward, and the chimney of the mill near Kalvi Küla, about 3 miles southeastward of the harbor; the chimneys of a cement factory at Aseri, about 5 1/2 miles southeastward of Mahu Sadam, are conspicuous.

At Purtse, about 4 1/2 miles southeastward of Aseri, there is a house with a conspicuous roof. The Purtse Jõgi flows out between high cliffs about 1 1/2 miles northward of the village; its mouth is shallow and only boats can

enter. A spar buoy, moored about $2\frac{1}{2}$ miles northward of the river entrance, marks the northern side of a detached shoal with a least depth of 2.7 m (1 $\frac{1}{2}$ fms.). A light is shown on the coast about $\frac{2}{4}$ miles eastward of the mouth of the Purtse Jõgi. About $9\frac{1}{2}$ miles eastward of the mouth of the Purtse Jõgi is Ontika Küla, 2 miles southward of which is a 262-foot hill with two dense clumps of trees, which are conspicuous. At Valaste, about 2 miles eastward of Ontika, are two windmills on a hill close to the coast. A light is shown at Valaste.

Caution.—Vessels are cautioned that gunnery and bombing practice is carried out periodically in an area northward of Valaste.

Toila Küla, about $4\frac{1}{2}$ miles east-southeastward of Valaste, is surrounded by trees and has a conspicuous windmill in the vicinity. The cliffs in this area are very steep in places. The Puha Jõgi flows out through a gorge about $\frac{3}{4}$ mile eastward of Toila Küla; at its mouth is a mansion with a tower. A short distance inland on the east bank of the river is Puha-jõe church with a black spire. About 6 miles eastward of the Puha Jõgi is the promontory of Päitenina, on which there are two windmills and a white coast guard house; southward of the former the chimneys of a distillery are conspicuous. The coast here is densely wooded. Tarsamae Light is located about $\frac{3}{4}$ mile westward of the point. Mere Küla, about 7 miles eastward of Päitenina has a post and telegraph office; the coast in the vicinity is cliffy and densely wooded, and about midway between Päitenina and Mere Küla, and $1\frac{1}{2}$ miles inland, are the Sinimaed hills, 279 feet high, partly wooded, and conspicuous from seaward.

The Narva Jõgi is the only navigable river flowing into Narva Laht. Its mouth, situated about $3\frac{1}{2}$ miles northeastward of Mere Küla, is about 300 feet wide, but increases to nearly

1,800 feet inside; the depths vary from 3 to 9.1 m (1 $\frac{3}{4}$ to 5 fms.). The banks are low and sandy, but rise to a height of 50 feet towards the town of Narva.

NARVA JOESUU

Position: 59°28'N., 28°02'E.

Depths: On bar, about 4.2 m (14 ft.).

In river, 3.1 to 9.1 m (10 $\frac{1}{2}$ to 30 ft.).

Anchorage, in roads, 18.3 m (10 fms.).

2C-12 The port of Narva Jõesuu is situated on the southwestern side of the entrance to the river; it is well sheltered from all winds.

Navigation.—Vessels from the westward bound to Narva Jõesuu may, from a position 10 miles north of Aegna Island, steer a course of 090° for a distance of about $48\frac{1}{2}$ miles to a position 4 miles south of the light structure on Vaindlo, thence a course of 108° for about $52\frac{1}{2}$ miles leads to the line of range at the entrance of the Narva Jõgi, or to the anchorage off the mouth of the river. These courses lead over depths of not less than 18.3 m (10 fms.).

If from the northward or eastward, pass about 3 miles eastward of the light structure on Iso Tytärsaari, then steer 153°, for about 9 $\frac{1}{2}$ miles, until the light structure on Vig-rund bears 066°, thence changing course to 129°, for about 22 miles to the anchorage off the mouth of the Narva Jõgi. These courses lead over depths of not less than 18.3 m (10 fms.).

The northeastern side of Iso Tytärsaari in line with the 525-foot hill on the southern end of Ostrov Sur-Sari, bearing 327°, leads northeastward of New Ground. The channel between Ostrov Lavensaari and Kurgalski Reef should not be used by vessels without local guidance.

Navigation season.—Navigation is generally open for about nine months of the year, and the sea is usually ice-free from the

middle of April until the beginning of November.

WINDS AND WATER LEVEL.—The depth on the bar at the entrance to the Narva Jogi varies with the direction of the wind. Gales from between northwest and southwest sometimes cause a rise of 5 feet above the normal level, and with gales from between north and east a fall of about 2 1/2 feet below the normal level. Access to the harbor is impossible during gales from south-southwest through west to north.

DEPTHS.—The depths off the port are considerable, the 10-fathom curve lying 2 miles offshore and the 6-fathom contour less than 1 mile from the entrance. The fairway across the bar is dredged annually to a depth of 14 feet. Depths in the river are from 10 1/2 to 30 feet; there is no tide.

LIGHTS.—A light is shown on the southern entrance point of the Narva Jogi. Two sets of range lights are located at the entrance to the river, one pair on either side. The northern pair in range 100° leads over the bar; the southern pair is altered as necessary to meet the changes in the channel due to silting. A light buoy is moored on the line of the northern range about 1 mile offshore.

ANCHORAGE.—The best anchorage is in a depth of about 10 fathoms 2 1/2 to 3 miles west-northwestward of Narva Light. Close offshore the current from the river, which attains a velocity of 2 knots at its mouth, is felt. The anchorage is open to northerly and westerly winds, which at times cause a heavy sea, but the holding ground is good.

PILOTAGE.—The pilot station is close to Narva lighthouse and pilots meet vessels in the roads outside the bar, weather permitting. Pilotage is compulsory from sea to Narva Joesuu.

DIRECTIONS.—Vessels bound for Narva Joesuu should approach the bar of the Narva Jogi on the outer entrance range (100°) and proceed until the inner range comes in line leading to a position in the river off the town.

2C-13 NARVA JOESUU serves as the outer harbor for the industrial town of Narva, which is located on the banks of the Narva Jogi about 7 1/2 miles from its mouth. River steamers ply between the two towns and Narva is connected to the general railroad system. The town of Narva is surrounded

by walls and towers and presents a medieval aspect; there are two bridges across the river here, over one of which the railroad crosses.

Narva Joesuu has a quay length of about 1,080 feet, but foreign vessels generally load and discharge at anchor in the river from or to barges. As the bar is so shallow, larger vessels must anchor in the roads.

Fresh provisions and water are obtainable. Repair facilities are extremely limited. There is a customhouse at Narva Joesuu and a lifeboat and line-throwing apparatus are maintained at the river entrance. There is a signal station on the western side of the Narva Jogi from which storm signals (sec. 1-15) are displayed.

COASTAL FEATURES—LANDMARKS (CONTINUED)

2C-14 REIMOSAR (Yami-sari) (Ostrov Reymo-Saar) lies about 11 miles northward of the light structure at the entrance of the Narva Jogi and about 3/4 mile offshore; on it there is a remarkable oak tree. A **BEACON** is located on the northwestern end of the island.

GAKKOV COVE (Gakkova Cove) lies close eastward of Reimosar. Two pair of **RANGE BEACONS**, inner and outer, lead to Gakkovo; the outer pair in line bears 047° and the inner pair 007 1/2°. The channel into the cove is also marked by **SPAR BUOYS**.

A **LIGHT** is located about 2 miles south-eastward of Gakkovo Cove.

Ropsha Light is shown about 5 3/4 miles south-southeastward of Reimosar.

KISKOLSKI REEF, parts of which are nearly awash, extends nearly 6 miles westward from the Kurgalski Peninsula. Its western edge is marked by a lighted whistle buoy equipped with a radar reflector, which also marks the eastern edge of the channel between this reef and Vigrund (sec. 2C-5). A shoal area, about 3 1/2 miles long in an easterly-westerly direction, and about 3/4 mile wide, lies southwestward of Kiskolski Reef; it has a least depth of 4 fathoms. A **SPAR BUOY** is moored at the eastern end of the shoal area.

A **LIGHT** is shown from the mainland about 5 miles north-northeastward of Reimosar. A **RADIOBEACON** is maintained at Kaibolovo about 6 miles north-northeastward of Reimosar.

KURGALSKI POINT, the northwestern extremity of the Kurgalski Peninsula, lies about 2 1/4 miles north-northeastward of Kaibolovo. A BEACON is shown on REIMI-SARI about 1 1/2 miles northward of Kurgalski Point.

A dangerous WRECK lies close northeastward of Kurgalski Point.

LUZHSKAYA GUBA

2C-15 Luzhskaya Guba, at the head of which is the port of Lujski (Ust-Luga), is entered between Kurgalski Point and Mys Kolgangya (Mys Kolgampya), 14 miles eastward. A LIGHT is shown on Pikhli Sari about 2 miles eastward of Kurgalski Point.

DANGERS.—**SHCHIT**, two shoal patches with depths of 4 and 3 fathoms, lie 3 and 3 3/4 miles northeastward, respectively, from Pikhli Sari Light. The northern patch is marked by a SPAR BUOY on its western and eastern sides. The southern patch is marked on its southern side by a spar buoy. A shoal with a depth of 3 fathoms at its northern end, lies about 3 1/4 miles eastward of Pikhli Sari light structure and is marked by a SPAR BUOY on its eastern and western sides. A 2 1/2-fathom patch lies about 4 3/4 miles east-southeastward of the aforementioned light.

TOULINA (MERILODA) REEF, which dries, lies in the middle of the bay toward the southern end. It is marked by two SPAR BUOYS on its southern side, one on its southeastern, and two on its southwestern side. A 2 1/2-fathom patch, close southward of the southern end of the reef, is marked on its northern side by a SPAR BUOY. Northward of Toulina Reef there are several shoals with depths of less than 3 fathoms. A LIGHT BUOY is moored on the southern side of Toulina Reef.

A SHOAL AREA, with depths of less than 5 fathoms, extends about 8 miles northward from a position about 1 3/4 miles westward of Mys Vistinski. **WESTGRUND** (Banka Vestgrund), the northern part of the shoal, dries in places; **SELG-MATALA** and **REPINSKYA LODA**, in the middle, and **TEMNAYA LODA**, at the southern end of the area, are groups of rocks with depths of less than 6 feet. The

eastern and western edges are marked by several SPAR BUOYS. A LIGHT BUOY is moored about 2 miles eastward of Westgrund, and a LIGHT BUOY is moored off the eastern side of Temnaya Loda.

About 1 1/2 miles westward of Repinskya Loda is a detached shoal, on which there is a rock awash, marked by a SPAR BUOY on its western side. A rock, with a depth of 3 feet, and a 6-foot shoal, marked by a SPAR BUOY, lie nearly 400 yards northwestward of Vistinski Light; an OBSTRUCTION, with a depth of less than 1 foot, lies about 1,400 yards southwestward of Mys Vistinski and is marked by four SPAR BUOYS, one on each side.

A SHOAL, with a least depth of 2 fathoms, extends about 2 miles westward from the mainland at Mys Kolgangya, being marked on its northern side by a SPAR BUOY.

The **EASTERN SIDE OF LUZHSKAYA GUBA** is bordered by foul ground; it is marked at its edge, about 4 miles southwestward of Mys Kolgangya, by a spar buoy.

A wreck with a depth of 3 feet over it, lies sunk about 4 miles west-northwestward of Mys Vistinski Light (see sec. 2C-16).

A SPOIL GROUND, marked at each corner by a SPAR BUOY with a blue flag, lies in the southeastern part of Luzhskaya Guba. The southern shore of the bay is less rocky, but there are few places where boats may land. A SPAR BUOY marks the northern edge of a rocky patch about 1 mile west-northwestward of the head of Koskolovskaya Pier.

COASTAL FEATURES.—**THE WESTERN SHORE** of the bay, formed by the eastern side of Kurgalski Peninsula, is densely wooded.

The village of Lipovskoye (Lipovo) is situated about 2 miles southward of the light structure on Pikhli Sari, and Ozero Lipovskoye lies in the middle of the peninsula and drains into Lipovaya Reka, which flows out on the northern side. A LIGHT BEACON stands on LUTO POINT about 4 3/4 miles south-southeastward of Pikhli Sari Light. The Vibya Reka flows out at the southwestern part of the bay, and about 1 3/4 miles farther eastward the Luga Reka discharges; between them there are some sand hills which approach the shore near the former.

A beacon stands on the western entrance point of the Luga Reka. Close eastward of the entrance is a red church with a green roof. A pair of lights in range 173° are shown on the eastern side of the entrance of the Luga Reka, and lead through the 4.6 m (15 1/2 ft.) dredged channel across the bar. A light buoy, No. 3, is moored on the line of range about 1 1/2 miles from the front range light structure; a light buoy, No. 2, is moored nearly 1/2 mile northward of the same structure. A second pair of light beacons in range 212° are shown near the timber pier on the eastern bank of the river. The channel into the Luga Reka is marked by spar buoys.

The Luga Reka connects with Narva Laht (sec. 2C-11) at the mouth of the Narva Reka through Rossona Reka. The dredged channel over the bar of the Luga Reka extends as far as a saw mill about 2 miles inside the entrance. Vessels not over 270 feet in length and with a draft not exceeding 15 feet can enter. Pilotage is compulsory. The use of tugs is obligatory for vessels with the maximum draft, but may be dispensed with, at the discretion of the pilot, if the draft is less than 14 1/2 feet. Vessels can anchor in about 7.3 m (4 fms.) in Lujski Roads, but clear of the dredged channel leading into the Luga Reka.

Storm signals (sec. 1-16) are shown from a flagstaff on the western entrance point of the Luga Reka. The river is usually frozen over until the middle of April.

2C-16 The eastern shore of Luzhskaya Guba has the Soikina Hills along its entire length, with two ridges which appear separated when seen from the northwestward and northeastward. On the northern ridge is Gorki Tower (59°48' N., 28°30' E.), standing at an elevation of 490 feet. A light is shown close northward of the tower. The southern ridge is 309 feet high, and has a high, white church on it which is conspicuous. There are villages on the ridges, the slopes of which are partly wooded and partly cultivated. There is a conspicuous windmill about 1/2 mile northward of Gorki Tower.

A light is shown on Mys Vistinski, about 5 1/2 miles south-southwestward of Mys Kolgangya.

Considerable berthing and repair facilities for naval vessels of the U.S.S.R. have been established at Rutchi, about 1 mile southward of Mys Vistinski. A light is shown at Rutchi. This berthing area and the channel leading to it are restricted to all but Soviet naval vessels. It has been reported (1965) that a major part of the Rutchi Port area is in a state of disrepair and has been abandoned.

Dubovskaya Gran Point is situated about 1 mile southward of Rutchi, and nearly 1 1/4 miles farther southward is Yugantovski Point. A light is shown on Yugantovski Point.

Koskolovskaya Pier, about 3 miles southward of Yugantovski Point, is connected by a light railway to a sawmill close northeastward of it. There is a depth of 3 m (1 3/4 fms.) at the pierhead.

Anchorage can be taken in Luzhskaya Guba in depths up to 18.3 m (10 fms.). Winds from between north and west cause a heavy sea throughout the bay. An area westward of Rutchi is reserved as an anchorage for naval vessels of the U.S.S.R. An area prohibiting anchoring and fishing lies south-southeastward of a line that extends eastward from the eastern extremity of O Lavensaari and the southern extremity of O Seyskari thence southward about 12 miles to the mainland.

2C-17 Directions.—Vessels from the northward or westward enter Luzhskaya Guba between Peni-sari and Ostrov Seyskari and pass westward of Kiseleva and Samoed shoals. When the beacon on the western entrance point of the Luga Reka bears 162°, steer for it on that bearing and anchor as necessary, or, if proceeding into the river, continue southward to the southern end of Toulina Reef and take aboard a pilot.

Vessels from the eastward pass between Veli-matala and Garkala-matala on a westerly course and when Pikhli Sari light structure bears about 206°, steer for it on that bearing until the beacon on the western entrance point of the Luga Reka bears 162°, then steer

for it and proceed as directed for vessels from the northward or westward.

The eastern side of the fairway on the western side of the bay, and the western side of the fairway on the eastern side of the bay, between Temnaya Loda and Toulina Reef, are each marked by two spar buoys. The western shore of the bay is marked by two spar buoys, and three spar buoys mark the line of the 3-fathom curve between the mouths of the Vibya and the Luga Reka.

COASTAL FEATURES—LANDMARKS (Continued)

2C-18 **Koporskiy Zaliv** is entered between Mys Kolgangya and Mys Vst'inskiy (Mys Usmynskiy), a low but conspicuous point $13\frac{1}{2}$ miles east-northeastward. A pair of lights in range 190° is shown on Mys Kolgangya. A light buoy is moored about 4 miles 190° of the front range light. Koporskiy Zaliv is open to northerly winds, and at times southwesterly winds cause a choppy sea. The shores of the bay are low, rocky, and covered with trees, interspersed with meadow and marshy ground.

The ruins of Kopore Castle, situated on a hill about 12 miles southward of Mys Ust'inskiy and visible about 15 miles from the northwestward, is conspicuous. Within the ruins of the walls is a church with a green dome and spire; a white church with a green dome stands a short distance farther southeastward. Other conspicuous objects are a red chimney at Pernovo, on the southeastern shore about $6\frac{1}{2}$ miles southward of Mys Ust'inskiy, and the chimneys of the glass works, about $3\frac{1}{2}$ miles south-southeastward of the same point.

The coast between Mys Kolgangya and Peipio (Peypiya), about $7\frac{1}{2}$ miles southeastward, is bordered by foul ground up to

$1\frac{1}{4}$ miles offshore. A pier, about 600 yards long and with a depth of 12 feet at its L-head, is situated at Peipio. Lights in range $171\frac{1}{2}^\circ$ lead across the bar to the pier. The Peipiya Reka flows out about $\frac{1}{2}$ mile westward of the pier. Anchorage for small craft may be had off the mouth of the river, in a depth of 10 feet, good holding ground, about 600 yards offshore.

Mys Doubovski (Mys Dubovskiy), is situated about $7\frac{1}{2}$ miles southeastward of Mys Kolgangya. A shoal, with a depth of 2 fathoms at its outer end, extends about $1\frac{1}{4}$ miles northwestward from Mys Doubovski and foul ground extends about 2 miles northeastward from the point; a light buoy is moored on the northwestern edge of the foul ground extending northeastward, and a spar buoy marks the outer edge of the foul ground extending northwestward.

Nearly 4 miles eastward of Mys Doubovski the Susta Reka (Sista Reka) flows into the bay. Foul ground encompasses this section of coast, extending up to $1\frac{3}{4}$ miles offshore.

At Uste (Ust'ye), about $2\frac{1}{4}$ miles southeastward of Mys Ust'inskiy, a pair of lights in range 054° is shown in the vicinity of a 450-foot pier, having a depth of 8 feet at its head. A shoal, with a depth of $1\frac{1}{4}$ fathoms, lies about $3\frac{1}{4}$ miles southwestward of Uste Pier. A spar buoy is moored about $\frac{1}{2}$ mile northward of the shoal. A light is shown on Mys Ust'inskiy and a number of spar buoys are moored $1\frac{1}{2}$ to $2\frac{1}{2}$ miles westward and northwestward of the point, one of which marks a dangerous wreck.

2C-19 The coast between Mys Ust'inskiy and Ostrov Karavalady, $5\frac{1}{2}$ miles northeast-

ward, is bordered by a reef that extends as much as $1\frac{1}{2}$ miles offshore. At Mys Osinova (Mys Osinovyy), about $3\frac{3}{4}$ miles north-eastward of Mys Ust'inskiy, there is a cove sheltered by a reef to the westward. A beacon stands on Mys Osinova. Anchorage is prohibited within 200 yards of a line extending about 1.2 miles from the mainland with the beacon on Mys Osinova bearing 190° .

Batareinaya Bukhta, close southward of Ostrov Karavalday, is bordered by rocks. Several spar buoys are moored off the western edge of the shoal extending westward from Ostrov Karavalday. The edge of the 3-fathom curve in Batareinaya Bukhta is marked by spar buoys. Anchorage can be taken by vessels with local knowledge in depths of 3 to $4\frac{1}{2}$ fathoms, but the bay is exposed to winds from north through west to south.

Between the eastern shore of Batareinaya Bukhta and Ozero Gorovaldayskoye about $\frac{1}{4}$ mile eastward, a large white house on a hill is conspicuous. A church on the eastern side of the lake is also conspicuous.

Measured distances.—Three spar buoys indicating measured distances are moored west-northwestward of Ostrov Karavalday; the westernmost buoy lies about $5\frac{1}{2}$ miles west-northwestward of Ostrov Karavalday.

Prijimova (Banka Prizhimova), a 14-foot shoal, lies about $1\frac{1}{4}$ miles west-northwestward of Ostrov Karavalday and is marked on its northern side by a spar buoy. A $3\frac{1}{2}$ -fathom shoal patch lies nearly $\frac{3}{4}$ mile westward of Ostrov Karavalday.

ANCHORAGES

2C-20 Ostrov Sur-Sari.—See section 2C-4.

Nore Kapel Lahti.—See section 2C-7.

Malmiget Laht.—See section 2C-7.

Ostrov Seyskari.—See section 2C-9.

Narva Jõesuu.—See section 2C-12.

Lujski Roads.—See section 2C-15.

Luzhskaya Guba.—See section 2C-16.

Peipio.—See section 2C-18.

Koporskiy Zaliv.—Anywhere in the bay with offshore winds in 6 to 10 fathoms in the southern part, and in 13 to 17 fathoms, sand and mud, in the northern part.

Batareinaya Bukhta.—See section 2C-19.

CHAPTER 3

NORTH SHORE OF THE GULF OF FINLAND—HANGÖUDD TO LENINGRAD GUBA

- Part A. Hangöudd to Helsinki
- Part B. Helsinki to Loviisa
- Part C. Loviisa to Hamina
- Part D. Hamina to Vyborgskiy Zaliv
- Part E. Vyborgskiy Zaliv
- Part F. Vyborgskiy Zaliv to Mys Styursudd

Plan.—This chapter describes the northern shore of the Gulf of Finland from Hangöudd to the northern entrance point of Leningrad Guba. The arrangement is eastward from Hangöudd,

GENERAL REMARKS

3-1 The northern shore of the Gulf of Finland trends east-northeastward about 165 miles from Hangöudd, the northern entrance point of the gulf, to Mys Kryuserort, the western entrance point of Vyborgskiy Zaliv. The shore is indented by numerous inlets and fronted by many islets. Vyborgskiy Zaliv indents the coast about 20 miles. Thence, from the northern point of Ostrov Piy-Sari, about 7 miles southeastward of Mys Kryuserort, the coast trends southeastward about 24 miles to Mys Styursudd, the northern entrance point of Leningrad Guba. The eastern part of the coast is not as extensively fronted with islets as the western part.

The harbors of Hanko, Loviisa, Hamina, Kotka, Vyborg, and Helsinki, the capital of Finland, are located on this coast and are important commercially; they are available for vessels of deep draft.

Caution.—See section 1-32.

Abnormal magnetic disturbance is found within the islands of the coast between Hangöudd and Porkkalanselkä, about 40 miles eastward.

NAVIGATION

3-2 See section 2-2.

ICE

3-3 Ice conditions prevail in the area covered by this chapter. For particulars see section 1-47 and consult the ice chartlets in chapter 1.

WEATHER AND CURRENTS

3-4 Winds and currents for the Gulf of Finland are described in sections 1-42 and 2-4.

Part A. HANGÖUDD TO HELSINKI

3A-1 Hangöudd (Hankoniemi) ($59^{\circ}49'$ N., $22^{\circ}54'$ E.), the northern entrance point of the Gulf of Finland, is the extremity of a peninsula extending southwestward from the mainland. It is rocky, about 45 feet high, and for the most part bare. Numerous rocks and islets, between which there are deep passages, front the southern side of the peninsula up to 8 miles offshore.

Lights are shown on several of the islands lying off Hangöudd and from various parts of the harbor of Hanko. A radiobeacon transmits from Gustavsvärn (sec. 3A-11), a small island in the southern approach to Hanko.

COAST—GENERAL

3A-2 Between Hangöudd and Helsinki, about 66 miles east-northeastward, the coast

is irregular with numerous widely scattered off-lying islands that are thickly clustered in places. These islands front the coast up to 8 miles offshore except in Porkkalanselkä, where an extensive inlet indents the coastal dangers. An inner passage leads through the off-lying dangers of the coast, but although well-marked by ranges, local knowledge is advised before attempting passage.

DEPTHS—OFFSHORE DANGERS

3A-3 The 20-fathom curve lies up to 11 miles offshore along this portion of the coast. A rocky bank, with depths of less than 37 m (20 fms.) and a least charted depth of 18.3 m (10 fms.), extends about 8 miles southward from the middle of the entrance to Porkkalanselkä. The depths within the curve are irregular and depths of over 37 m (20 fms.) are charted between the islands. All other dangers lie within the 20-fathom curve and will be described with the coastal features and approaches of the harbors.

NAVIGATION

3A-4 From a position about 15 miles southward of Russaro light, a course of 074° for about 63 miles leads to a position about 8 miles southward of Helsinki Light (sec. 3A-22).

APPROACHES TO HANKO—DANGERS

3A-5 Russarö (59°46' N., 22°57' E.) is an island on the western side of the approach fairway to Hanko about 2½ miles south-southeastward of Hangöudd. It is 46 feet high and partly covered with birch trees. A light is shown from the southern end of the island. When the fog signal at Gustavsvärn is out of order a fog signal is sounded at Russarö. Two beacons in range 200° stand about ½ mile northward of Russarö Light. This range indicates a 12-foot channel leading to Russarö. Two beacons, in range 265½° and which indicate a 28-foot channel, stand about 1 mile northward of Russarö. Several small islets of foul ground lie within 1 mile southward and ½ mile westward of the western part of the island and within 1¼ miles

southeastward and ¼ mile eastward of the southern end of the island. A light is shown on Lilla Tärnsjär, the southeasternmost of these islets.

Pobädonosets, a shoal with two heads, the northeastern of which has a depth of 6.4 m (3 1/2 fms.) and southwestern a depth of 6.7 m (3 3/4 fms.) lies about 4 miles southward of Russaro. The northeastern head is marked on its eastern side by a spar buoy. A spar buoy marks the eastern side of a 10 m (5 1/2 fms.) shoal about 3/4 mile southward of the southwestern head. A spar buoy is moored on the eastern side of Ahkera, a 4.5 m (2 1/2 fm.) shoal about 3/4 mile northward of Pobadonosets. A 5.8 m (3 1/4 fm.) shoal lies between these two shoal areas and a 8.2 m (4 1/2 fm.) rocky patch lies about 1 mile farther westward.

A 6.7 m (3 3/4 fm.) and a 9.1 m (5 fm.) spot lies about 2 1/2 and 3 1/4 miles south-eastward of Russaro; spar buoys are moored on these spots. A 7.6 m (4 1/4 fm.) rock lies about 1/2 mile westward of the 6.7 m (3 3/4 fm.) spot. A 9.1 m (5 fm.) shoal with a spar buoy moored on its eastern side lies about 1 1/4 miles eastward of the southern end of Russaro.

The afore-mentioned dangers lie on the western side and the dangers described below lie on the eastern side of the approach to Hanko. These dangers are marked in accordance with the uniform system of buoyage (sec. 1-18).

Ajax Shoal, with a least depth of 4.5 m (2 1/2 fm.), lies about 8 miles east-south-eastward of Russaro and is marked by a lighted buoy and by spar buoys. A spar buoy is moored on a 7.6 m (4 1/4 fm.) shoal about 2 1/2 miles west-northwestward of Ajax Shoal. Detached patches of foul ground, with depths of 4.5 to 8.2 m (2 1/2 to 4 1/2 fms.), and an underwater rock, with a depth of less than 1.8 m (6 ft.), lie within 1 3/4 miles northward and 1 1/2 miles northeastward of the 7.6 m (4 1/4 fm.) shoal.

The area westward, northwestward and northward of Ajax Shoal has numerous dangerous shoals, some of which are awash.

A light buoy is moored about 1 mile south-southeastward of Ajax Shoal.

Adgrund, a rock with a depth of 0.6 m (2 ft.), lies about 4 miles eastward of Russaro.

Yttre Vasterland, an islet and a group of above- and below-water rocks, lies about 3 1/4 miles east-northeastward of Russaro. Foul ground surrounds the islet up to about 1/4 mile offshore.

An 8.2 m (4 1/2 fm.), marked by a spar buoy, lies about 1 1/2 miles southward of Yttre Vasterland. Two patches of 6.4 and 7.6 m (3 1/2 and 4 1/4 fms.) lie between the islet and the shoal. A 6.4 m (3 1/2 fm.) patch, with a spar buoy moored off its western side, lies about 1 1/2 miles westward of Yttre Vasterland.

Inre Vasterland is an islet that lies about 1/2 mile north-northwestward of Yttre Vasterland. Patches of foul grounds, with a least depth of 0.91 m (3 ft.), extend about 2/3 mile southwestward from the islet. Four spar buoys, moored northward and northeastward of Inre Vasterland, mark the channel leading through foul ground in that area. A light stands on Andalskar about 1 1/5 miles west-northwestward of Inre Vasterland.

WESTERN APPROACHES.—Tomasesland is an islet about 1 1/8 miles westward of Russaro. Several patches of foul ground, with depths of less than 1.8 m (6 ft.), lie within 1/2 mile northeastward, 1/3 mile eastward, and 1 1/3 miles southward of the islet. A beacon stands on Vasterbada, a reef about 3/4 mile westward of Lilla Tarnskar. The dangers immediately westward of Russaro are described with that island.

Måsskär is the middle of a group of islands that lie within 2 miles southeastward through southwestward of Hangöudd; it lies about 1 1/4 miles north-northwestward of Russarö. A pair of lights in range 001 1/2° is shown on the island and a rock close southward and mark the fairway westward of Russarö.

Ryssö, the largest island of the group, lies about 1/8 mile eastward of Måsskär.

Granskärgrund and **Kistiskär** are two islets lying about 1/2 mile southward and southwestward, respectively, of Hangöudd. A light is shown on each islet, both lights being in range 312°. These lights and the lights shown from Måsskär mark a fairway available to vessels with a draft of 26 feet between the above-mentioned dangers to the outer harbor of Hanko.

A fairway for 24-foot drafts leads through the Åland Islands from Turku (sec. 5E-2) to Hanko. This fairway leads westward of Utterklint (sec. 5A-4), which lies about 1 1/2 miles westward of Hangöudd, thence eastward of Granskärsharu, an island located about 2/3 mile southwestward of Kistiskär, and thence southward of Kistiskär to the outer harbor. Lights are shown from each of these islets.

HANKO (HANGÖ)

Position: 59°49'N., 22°57'E.

Depths: Approach, 28 to 46 m (15 to 25 fms.).

Anchorage, 9.1 to 37 m (5 to 20 fms.).

Outer harbor, 0.9 to 8.9 m (3 to 29 1/2 ft.).

Inner harbor, 5.9 to 12.2 m (19 1/2 to 40 ft.).

Eastern harbor, 2.7 to 4.2 m (9 to 14 ft.).

Berths, 2.7 to 8.9 m (9 to 29 1/2 ft.).

Port plan: See section 3A-14.

3A-6 The port of Hanko lies on the southern side of a peninsula about 2 miles east-northeastward of Hangöudd. It consists of an inner and an eastern harbor at the town and an outer harbor close eastward of the extremity of Hangöudd.

NAVIGATION

3A-7 From westward: From a position on the coastal track (sec. 3A-4) about 10 miles southward of Russarö a course of 030° for about 8 miles leads to a position about 1 3/4 miles southeastward of the spar buoy moored on the 9.1 m (5 fm.) spot about 3 1/4 miles southeastward of Russaro (sec. 3A-5). From here a course of 320° leads toward the harbor.

From eastward: From a position on the coastal track (sec. 3A-4) about 6 3/4 miles southward of Sundharu a course of 279° for about 14 1/2 miles leads to a position about 1 3/4 miles southeastward of the spar buoy mentioned above. From here a course of 320° leads toward the harbor. This track passes about 1 1/4 miles southward of Ajax Shoal and leads over a least charted depth of 31 m (17 fms.).

NAVIGATION SEASON

3A-8 Hanko is the winter port of Finland and is kept open through the winter by ice breakers.

DEPTHS

3A-9 In the approach fairway there are depths of 31 to 46 m (17 to 25 fms.) on the entrance range and patches of 10.9 to 16.4 m (6 to 9 fms.) adjacent to the fairway. The fairway westward of Russaro has depths of 7.3 to 28 m (4 to 15 fms.). The anchorage northwestward of Gustavsvärn has general depths of 14.6 to 33 m (8 to 18 fms.); a spar buoy is moored on a 8.2 m (4 1/2 fm.) patch in the middle of the anchorage about 1/2 mile north-northwestward of Gustavsvärn.

There are depths of 5.9 to 12.2 m (19 1/2 to 40 ft.) in the inner harbor, 0.9 to 8.9 m (3 to 29 1/2 ft.) in the outer harbor, and 2.7 to 4.2 m (9 to 14 ft.) in the eastern harbor. Vessels of 30-foot drafts can safely reach the inner harbor.

ASPECT—LANDMARKS

3A-10 Hanko is located on the southern side of the low sparsely-wooded peninsula projecting southwestward from the mainland. There are several hills of moderate height. The water tower and the church spire in the town and the lighthouse on Russarö are good landmarks.

HARBOR

3A-11 Gustavsvärn lies on the western side of the entrance to the roadstead of the harbor. It is the northeasternmost danger of those described with Hangöudd in section 3A-1. On the eastern side of the entrance numerous islets and patches of foul ground extend about 1 1/2 miles south-southeastward from Drottningberget, a projection about 1 mile north-northeastward of Gustavsvärn. The entrance between these dangers is about 3/4 mile wide.

The outer harbor is formed on its eastern side by Tulludden (Tulliniemi), a small peninsula protruding about 1/3 mile southward from about 1/2 mile eastward of the extremity of Hangöudd. A pier projecting about 300 yards south-southeastward from the shore between these points forms the western side.

The inner harbor lies in the northeastern part of a bight indenting the shore between Tulludden and Drottningberget, about 1 1/2 miles east-northeastward. Notholm and Högholm, two necks of land protruding about 1/4 and 1/3 mile southwestward, respectively, from Drottningberget, form the northern and southern sides of the harbor. Meijerfelt is an islet about 600 yards southward of the extremity of Högholm. A spar buoy is moored on a rock, with a depth of less than 1.8 m (6 ft.), close westward of the islet. Foul ground, with depths less than 5.5 m (3 fms.), lies up to 1/4 mile offshore in the northern part of the bight and westward of the inner harbor.

The eastern harbor is a small inlet formed on its western side by Drottningberget.

Koppnas, a harbor opened in 1969, 1 1/2 miles northward from Hanko church is approached from the westward by a channel authorized for a 20 foot draft.

Navigational aids.—A light is shown on Gustavsvärn and a fog signal is sounded. A radiobeacon is transmitted and in fog synchronizes with the fog signal for distance finding.

A pair of lights in range 265 1/2° stand on the eastern side of Ryssö and a small islet close eastward.

Meijerfelt range lights in line 327°, located on Meijerfelt Islet and the mainland, lead from seaward to the Metsanhakkaus range.

Metsanhakkaus Light is situated about 3/4 mile northwestward of Meijerfelt, and in range 327° with the light on Meijerfelt leads clear of all dangers to the entrance of the inner harbor from northeastward of Russaro.

A light is shown on the head of Högholm and a fog signal is sounded.

A light is shown on Tullholm, an island fronting the entrance to the outer harbor. Kajgrund Light is shown nearly 1/4 mile westward of Tullholm Light.

A pair of lights in range 060° stands on Tulludden and leads through the fairway from Kistskär.

A pair of lights in range 274 1/2° is shown the northern part of the outer harbor and marks the fairway for 18-foot drafts approaching the harbor between the islands offshore between Hanko and Tammisaari (sec. 3A-17). A pair of lights in range 331° is shown from the eastern harbor and leads from the above-mentioned fairway into that harbor.

A beacon stands on the southern edge of Tulludden. Buoys mark the dangers adjacent to the fairways according to the uniform system (sec. 1-13).

Lifesaving stations are maintained at the inner harbor and Gustavsvärn; there is a motor lifeboat at Gustavsvärn.

A submarine cable (sec. 1-34) is laid between Tulludden and Gustavsvärn and between Gustavsvärn and Russarö. Anchorage is prohibited in this area.

A submarine pipeline carries water from Hanko to Russaro; its landing places are marked by beacons and notice boards.

Signals and regulations.—The berth assigned an entering vessel is indicated with a red flag by day and by a red light at night.

The following is a summary of the harbor regulations: A vessel's call letters are to be displayed until arrival is reported. Vessels are to proceed at slow speed entering and leaving the harbor. If not entering to load or discharge, anchorage in the inner harbor is not allowed without permission. Vessels with more than 88 pounds of gunpowder, 16 pounds of dynamite, or 13 gallons of inflammable liquid, as cargo, shall show a red flag by day and a red light at night.

Anchorage may be taken in 16 to 17 fathoms, mud, in the roadstead northwestward of Gustavsvärn with Hangöudd bearing 281° and Gustavsvärn Light bearing 123°. Anchorage may also be taken about ¼ mile northwestward of Meijerfelt in 17 fathoms, mud.

Anchorage is prohibited in the approach to Hanko eastward of Makarova, a 4½-fathom shoal about ½ mile north-northwestward of Gustavsvärn.

PILOTS

3A-12 Pilotage is compulsory for merchant and naval vessels. The pilot cruising ground is about 3 miles southeastward of Hanko. Pilots can also be obtained at Utö. (sec. 5B-1). The harbor station is at Tulludden.

DIRECTIONS FOR ENTERING

3A-13 Vessels enter from southeastward with Meijerfelt range lights in line 327°, passing eastward of Russaro, to a position about 1 mile southeastward of Gustavsvärn where Metsanhakkaus light and beacon come in range 320°; thence to a position about ½ mile west-southwestward of the inner harbor.

Vessels proceeding to the roadstead of the harbor follow the above directions until the light on Tullholm bears between 264° and 273° and thence steer in between these bearings.

FACILITIES

3A-14 Hanko is located on the eastern side of the inner harbor. It is important as a seaport and is a terminus of the Finnish railroad; it is also frequented as a summer resort.

Berths.—Outer harbor pier, eastern side: berthing length, 500 feet; depth alongside, 25½ feet. A 5-ton travelling crane is available.

Inner harbor, Notholmskajen: berthing length, 1,300 feet; depth alongside, 26 feet. A 40-ton stationary crane, two 2½-ton travelling cranes, and two 5-ton travelling cranes are available.

German Quay: berthing length, 490 feet; depth alongside, 19½ feet. Two 2½-ton travelling cranes are available.

Högholmskajen: berthing length, 2,300 feet; depth alongside, 25 feet. Two 2½- and two 3-ton travelling cranes are available.

Nuottasaari Coal Quay: berthing length, 230 feet; depth alongside, 29½ feet.

A 300-foot pier extends from the shore northward of Nuottasaari Coal Quay. The channel leading to this pier had a depth of 17 feet in 1953.

Railroad tracks are laid onto all piers and quays. Tugs are available.

In the eastern harbor there is a pier, about 200 feet long and with a depth of 9 feet alongside, extending from the head of the harbor.

Supplies.—Deck and engine supplies and provisions are available in a limited quantity. Water is piped to all berths. A small quantity of bunker coal and diesel oil is available.

Repairs.—Repairs of a minor nature can be made. A salvage steamer is stationed in the port.

Communications.—Hanko is the terminus of the Finnish railroad, and there is a good highway to other towns. There is regular steamship service with American and European ports. A radio station and telegraph office are located in the town.

Deratization.—See section 1-7.

Medical.—There is a municipal hospital for seamen. The sanitation of the town is good. Health officials board only in the event of a contagious disease.

COASTAL FEATURES

3A-15 Between Hanko and Tvärminneö, an island connected to the coast about $8\frac{3}{4}$ miles east-northeastward, the coast is rocky, indented by numerous inlets, and backed by wooded hills of moderate height. Numerous dangers with irregular depths between them extend up to $6\frac{1}{2}$ miles offshore. The southernmost and outer danger is Ajax Shoal, described in section 3A-5. Fairways for 17- and 28-foot draft vessels leads between the offshore dangers about $1\frac{1}{2}$ miles off the coast. These fairways, although well-marked with lights, beacons, and spar buoys, should not be attempted without local guidance. The first light shown in these fairways from Hanko is on Andalskär, about $1\frac{3}{4}$ miles southeastward of Hanko.

APPROACHES TO TAMMISAARI—DANGERS

3A-16 Western side.—Ajax Shoal is the outer danger in the approach to Tammisaari. Ittergrund, a foul ground patch with a depth of $80\frac{1}{2}$ feet, lies about $2\frac{3}{4}$ miles north-northeastward of Ajax Shoal; Längden, a rock from which a light is shown, lies about $\frac{2}{3}$ mile farther northward. Patches with depths of 2 and 3 fathoms lie about $\frac{2}{3}$ and $1\frac{1}{3}$ miles north-northeastward of Längden. These patches and Ittergrund are marked by spar buoys. Foul ground and islets lie within $\frac{3}{4}$ mile eastward through $1\frac{3}{4}$ miles southward of the eastern end of Tvärminneö. Spar buoys are moored at the extremities.

Eastern side—A 3-fathom patch lies about $2\frac{1}{3}$ miles eastward of Ajax Shoal. Dangers extend southward from the shore to within 3 miles eastward of the 3-fathom patch; a spar buoy is moored close southward of the outermost danger. A 6-foot patch lies about $1\frac{1}{4}$ miles north-northeastward of the 3-fathom patch and several dangers with a least charted depth of 14 feet lie about $1\frac{1}{2}$ miles farther northward.

Storgadd, an islet on which stands a beacon, lies about $1\frac{1}{2}$ miles eastward of Längden. A $3\frac{1}{4}$ -fathom patch, marked on its western side by a buoy, lies about $\frac{2}{3}$ mile west-southwestward. Several patches of $1\frac{3}{4}$ to $5\frac{1}{4}$ fathoms lie within 1 mile northwestward of the islet and are marked on the northwestern side by a spar buoy. Sextant, a shoal with a charted depth of $2\frac{3}{4}$ fathoms, lies about 2 miles northward of Storgadd. Buoys mark the northern and western sides of this shoal.

Hasto Busö, the eastern entrance point of Tammisaarifjord, lies about 2 miles eastward of Tvärminneö. A 4-foot spot marked by a spar buoy and a 7-foot spot marked by two spar buoys lie about $\frac{2}{3}$ mile southwestward and westward of the island.

Stor Sundsharu is an island lying about midway between Hasto Busö and Tvärminneö, about 2 miles westward. A light is shown on the island. Skomakarskär, an islet, lies close northwestward.

Nybergskan Light is shown on an islet of the same name located about $\frac{1}{4}$ mile westward of Stor Sundsharu.

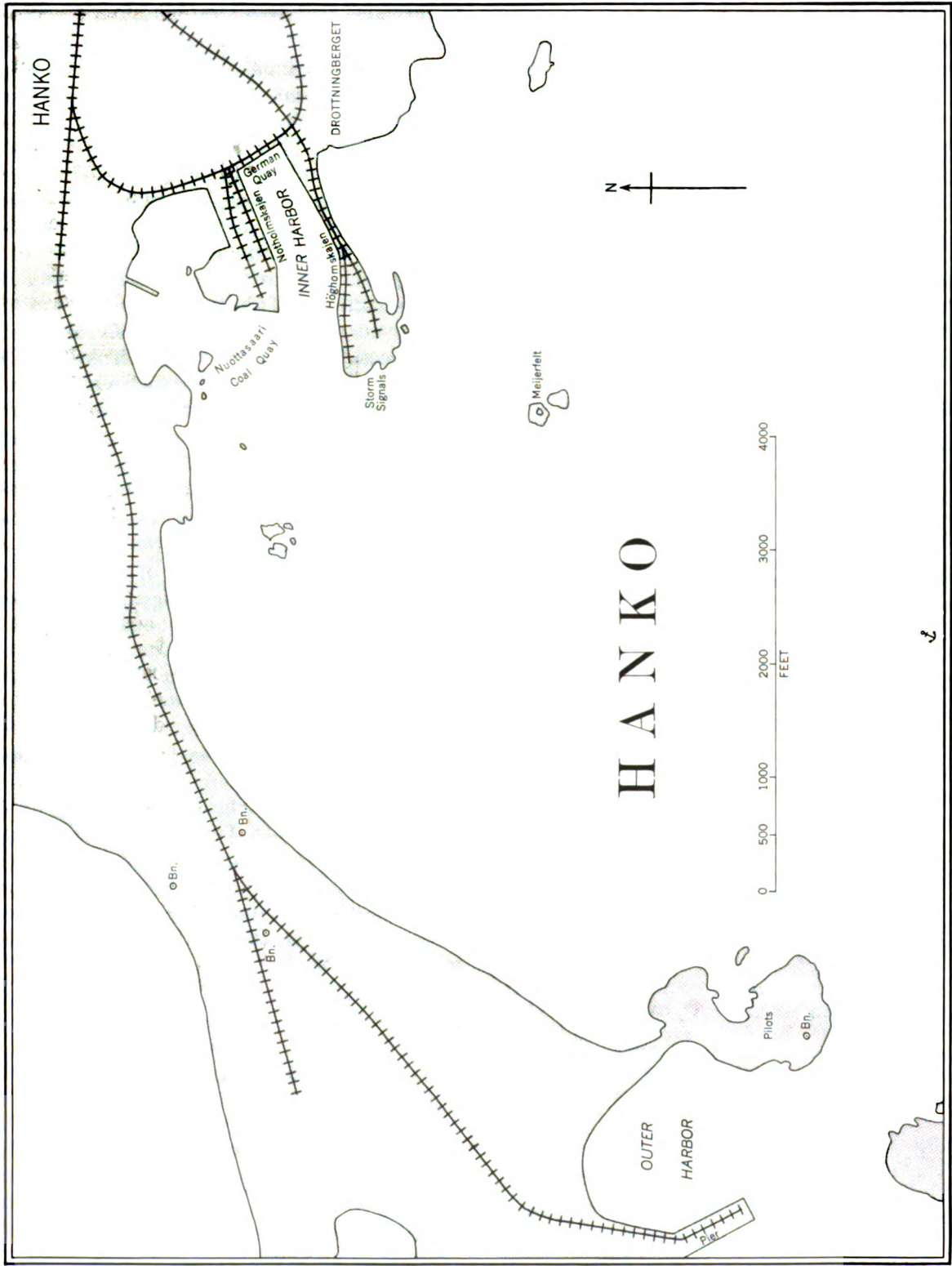
Koö is an island lying about $1\frac{1}{2}$ miles northeastward of Tvärminneö. A light is shown from the southern end of the island. Dangers lie up to 1 mile southward of the island and are marked by buoys. A light is shown on Asparu, an islet located in the middle of the dangers about $\frac{7}{8}$ mile north-westward of Stor Sundsharu. Numerous islets and patches of foul ground lie within $\frac{2}{3}$ mile southwestward, westward, and north-westward of Koö. These are marked on their western sides by beacons and buoys.

The entrance range is formed by the light ⁰³⁰ on Koö and Stor Sundsharu in range 013°.

TAMMISAARI (EKENÄS)

Position: 59°59' N., 23°26' E.

Depths: Approach fairway, $6\frac{1}{2}$ to 30 fathoms.
Entrance channel, 15 feet.
Anchorages, 3 to 24 fathoms.
Quays, 9 to 15 feet.



3A-17 The port of Tammisaari, about 10 miles north-northeastward of Tvärminneö, lies at the head of Tammisaarifjärd and at the entrance of Pohjoviken (sec. 3A-19).

Navigation.—**From westward:** From a position on the coastal track about 10 miles southward of Russarö (sec. 3A-4) a course of 052° for about $10\frac{1}{2}$ miles leads to about $1\frac{1}{4}$ miles south-southeastward of Ajax Shoal.

From eastward: From a position on the coastal track about $6\frac{3}{4}$ miles southward of Sundharu (sec. 3A-4) a course of 281° for about 10 miles leads to about $1\frac{1}{4}$ miles south-southeastward of Ajax Shoal.

These courses lead well southward of all offshore dangers and intersect the entrance range leading into Tammisaarifjärd.

Navigation season.—Beginning of May to beginning of December.

Currents.—During the melting of the ice in Pohjoviken the current sets continuously outward in Tammisaarifjärd. As the navigation season lengthens the currents become irregular because the water becomes brackish from the mixture of fresh water from the inlet and the salt water in the fjord.

Depths.—The approaches to the fjord are over 10 fathoms. Between the entrance to the fjord and the shallows commencing about $3\frac{1}{2}$ miles southwestward of the harbor the depths are from 5 to 10 fathoms. Fairways for 29½-foot drafts lead to Lappohja, for 24-foot drafts to Skogby and $3\frac{1}{2}$ miles southwestward of the harbor, for 20-foot drafts to the anchorage southwestward of the town, and for 15-foot drafts to the quays. Fairways

for 18- and 24-foot drafts enter the fjord between the islands lying eastward and westward of the entrance.

Harbor.—Tammisaarifjärd extends about $3\frac{1}{2}$ miles northward and 7 miles farther northeastward between the mainland on its western side and the Tammisaari Archipelago to eastward. A fairway about 200 yards wide at its narrowest part leads between the dangers in the fjord.

Lappohja (Lappvik) and Skogby, about 3 miles northward of Tvärminneö and $2\frac{1}{4}$ miles farther northeastward, respectively, are loading places for the district of Hanko. There are seven berths at Lappohja with a depth of 24 feet and one berth at Skogby with a depth of $19\frac{1}{2}$ feet alongside. Between these loading places, islands extend up to $\frac{1}{4}$ mile from the coast. The fairway is narrow between these islands and Hermansö, a large island about $\frac{1}{4}$ mile northward of Koö, and also about $2\frac{1}{4}$ miles northeastward of Skogby where the islands of the archipelago approach the mainland close off. An overhead cable, with a vertical clearance of 114 feet, crosses the fairway at the narrows about $1\frac{1}{2}$ miles northeastward of Skogby.

Range lights, beacons, and spar buoys mark the narrow stretches and adjacent dangers of the fairways through the fjord to the harbor. Submarine cables (sec. 1-34) cross the fairway between Tvärminneö and Hasto Buso, and between Lappohja and Ekö, an island close southeastward. A railroad bridge, with a 28-foot opening, crosses the entrance to Pohjoviken in the northern part of Tammisaari harbor.

Anchorage may be taken northward of Hasto Buso or Tvarminneo in 12.8 to 44 m (7 to 24 fms.), mud. There is anchorage off the piers at Lappohja in 15.5 m (8 1/2 fms.) mud. Vessels can anchor in 6.1 m (20 ft.) mud, about 1 mile southwestward of the harbor quays.

Pilots are compulsory for merchant and naval vessels. The pilot cruising ground is about 3 miles southwestward of Hasto Buso. There are pilot stations at Hasto Buso and Skansudd.

Directions for entering.—When the lights on Koö and Stor Sundsharu are in range 013°, steer on this range through the fairway to the entrance of the fjord, about 1/4 mile southward of Stor Sundsharu. Thence steer through the fairways to the loading places in the fjord or Tammisaari, being guided by the various ranges and navigational aids.

3A-18 Tammisaari, with a population of about 4,000 in 1951, is a small fishing and commercial village. There are three piers, the main one having a length of 490 feet and a depth of 3.9 to 4.5 m (13 to 15 ft.) alongside. Water is available at the main pier and a 5-ton movable crane is located there. Provisions are obtainable.

There is telegraph and telephone communication with other parts of Finland. The main pier is connected by railroad to the general system, and coastal steamers operate to Hanko and Helsinki.

COASTAL FEATURES (Continued)

3A-19 Pohjoviken (Pohjanlahti), entered close northwestward of Tammisaari, extends about 8 miles northeastward. There are general depths of 10.9 to 37 m (6 to 20 fms.) and many dangers interspersed in the inlet. A fairway for 14-foot drafts leads into the inlet and to the wharves at Pohja at the head of the inlet; it is marked by spar buoys. The wharves have a depth of 4.2 m (14 ft.) alongside and they are connected to the general railroad system.

The Tammisaari Archipelago fronts the mainland up to 6 miles offshore between Hasto Busö and Hög Bågaskär, which lies at the western entrance point of Porkkalan-selkä (sec. 3A-21) about 22 miles east-northeastward. The 20-fathom curve lies 5 to 7 miles southward of the archipelago and all dangers lie within the curve. Two fairways for 18- to 24-foot drafts lead along the southern part of the islands. These fairways lead

from Tammisaarifjard to Porkkalan-selkä, are intricate, and, although well-marked with navigational aids, should not be attempted without local knowledge. A marked channel connects the main 18-foot and outer 24-foot draft channels about 2 3/4 miles eastward of Hasto Buso.

Stor Jussarö (59°50' N., 23°34' E.) is a rocky, bare islet of moderate height at the southern part of the Tammisaari Archipelago and about 7 miles eastward of Hasto Busö. Numerous islets and patches of foul ground lie within 3/4 miles eastward through southward of the island. A disused lighthouse stands on the southeastern point of the island. An 18-foot draft fairway passes westward of Stor Jussarö to the fairways of the archipelago; spar buoys are moored on the dangers adjacent to the fairway. A 18-foot draft buoyed channel branches from the main 24-foot draft channel about 1 1/4 miles northwestward of the northern tip of Stor Jussaro, and leads southeastward into the harbor just north of Stor Jussaro. Leading light-beacons are established on the northwestern extremity of Stor Jussaro. A 12-foot fairway, marked by beacons, leads from a position about 3/4 mile northward of Stor Jussaro in a generally northwestern direction for about 4 miles to Baggo.

Backesbranten Fishing Light, shown only when required, is displayed on the northeastern extremity of Stor Jussaro. Stenharu Fishing Light, shown when required, is displayed on the islet about 2 miles westward of the fishing light on Stor Jussaro.

Ronnharun (Renharu) Fishing Light is shown on the northern part of an islet nearly 6 miles east-northeastward of Jussaro Fishing Light, and Haru Bredgrund (Andgrund) Fishing Light is shown on the western part of an islet about 3 1/2 miles farther east-northeastward.

Anchorage can be taken in 26 to 31 m (14 to 17 fms.), mud, just northeastward of the island close northward of Stor Jussaro.

Jussaro Light, equipped with a radar reflector, is shown on Sundsharu, an islet about 2 miles southward of the southwestern end of Stor Jussaro.

Vasterbadan, a shoal with a depth of 3.6 m (2 fms.) about 8 1/2 miles eastward of Stor Jussarö, and Svartbådan, an islet about 5 1/4 miles farther northeastward, are the outermost dangers between Stor Jussarö and Hög

Bagaskar. A 5.5 m (3 fm.) patch, marked on its eastern side by a spar buoy, lies about 1 1/4 miles southeastward of Svartbadan. A spar buoy is moored on the southern side of Vasterbadan and a light is shown occasionally from Svartbadan. Islets and patches of foul ground extend up to 2 1/4 miles southward from Hög Bågaskär.

A local magnetic anomaly was reported (1964), about 4 miles eastward of Svartbadan Light.

Hög Bågaskär lies about 2 1/3 miles north-northeastward of Svartbadan. Foul ground in patches lies within 3 1/3 miles southeastward and 4 1/2 miles east-southeastward of the island. A tower on the island in range 338 1/2° with a beacon on a rock about 7/8 mile south-southeastward leads through a fairway for 18-foot drafts; spar buoys mark

the adjacent dangers. This fairway passes westward of Hög Bågaskär and joins the 18 foot draft fairway, northward of the island, leading toward the Barö Sund area to the northwestward, the track being marked by buoys, beacons, and lighted ranges. Pilots are stationed on the island and a lifesaving station is maintained.

PORKKALANSELKÄ

3A-20 This section has been deleted.

3A-21 Porkkalanselkä indents the dangers lying off the coast between Hög Bågaskär and Mäkilo, about 9 1/2 miles eastward. There are general depths of 12.8 to 42 m (7 to 23 fms.) and many dangers interspersed in the fjord. The western side is formed by the Tammisaari Archipelago, which here

extends 6 miles southward from the coast, and the eastern side by the peninsula extending about 7 miles south-southwestward from the coast and ending in Porkkalaudd, and thence the islets extending about 3 1/2 miles south-southwestward to Makilo. The islets in the fjord are bare and rocky, and the coast is low and wooded.

Traffic separation lanes have been established in the routes leading to Porkkalan-selka and can best be seen on the chart.

From westward, fairways for 18-foot drafts leading through the Tammisaari Archipelago and 18-foot drafts from Hög Bågaskär join northeastward of Stor Angestö. Thence a fairway for 18-foot drafts leads east-northeastward and thence southeastward to an anchorage on the eastern side of Träskön (Stor Träskö). This fairway passes between Högholm, about 3 1/2 miles east-northeastward of Stor Angestö, and Stickelland, a rock close southeastward; thence between Karlhamn, about 4 miles east-southeastward, and its off-lying dangers; and thence between Porkkalaudd and Träskön, about 1 mile southwestward. Lights are shown from Högholm, Stickelland, Karlhamn, and Träskön. Ranges mark the fairways and spar buoys mark the adjacent dangers.

Another fairway leads from a position about 3 miles north-northeastward of Hog Bagaskar, first in a southeasterly direction for about 4 miles and then in an easterly direction for about 7 miles to Porkkala. This fairway may be used by vessels of 33-foot draft.

From southward, three fairways lead to Porkkala. The westernmost fairway, authorized for a draft of 33 feet, leads in a north-easterly direction; it passes about 1/2 mile westward of the Sommaroarne Islets and joins the 33-foot draft fairway mentioned above.

The middle fairway, authorized for a draft of 26 feet, leads north-northeastward, passing westward of Porkkalan Kallbada and Makilo, thence trends eastward to Porkkala.

The easternmost fairway, authorized for a draft of 26 feet, leads northward and passes between Porkkala and Salmo, about 1/4 mile southeastward.

Ranges mark the above fairways and spar buoys mark the adjacent dangers.

Pikkalafjärd is the largest of the inlets indenting the irregular northern shore of Porkkalanselkä. A fairway for 18-foot drafts leads to an anchorage in 5.5 m (18 ft.), mud, off the town of Pikkala at the head of the fjord. Anchorage may also be taken in 9.1 to 12.8 m (5 to 7 fms.), mud, about 1 mile northward of Svino, an island in the middle of the fjord.

KANTVIK (60°05'N., 24°23'E.), a town located on the northeastern end of the bay which lies eastward of Pikkalafjärd, is the site of a sugar refinery and pier. The pier is 360 feet long with a depth of 9.4 m (31 ft.) alongside. The fairway from the Gulf of Finland to Kantvik, marked by ranges and buoys, has an official depth of 9.1 m (30 ft.). A 5.5 m (18 ft.) channel continues northward to the pier at Batvik located at the head of the bay.

Porkkalan Kallbada (59°52'N., 24°18'E.), a rock with foul ground extending about 3/4 mile from its eastern and southern sides, lies about 3 miles south-southwestward of Makilo. A light is shown from the rock. A radiobeacon transmits and a fog signal is sounded from the light structure. A pilot station is located on the rock. Patches of foul ground lie interspersed between Porkkalan Kallbada, Makilo, the Sommaroarne Islets, about 2 3/4 miles westward, and Hog Bagaskar, and thence extend south-southwestward to Savin, a 3.9 m (2 1/4 fm.) shoal about 4 miles west-southwestward of Porkkalan Kallbada. An 8.2 m (4 1/2 fm.) patch reportedly lies about 2 1/2 miles southward of Savin. Another patch with 9.1 m (5 fms.) lies about 1 1/2 miles southwestward of Sommaroarne and close westward of the fairway that approaches Sommaroarne from the southeast. Foul ground lies up to 4 miles off the northern shore of the fjord.

Porkkala, an island, lies about 1 mile south-eastward of Traskon. A light is shown on the island. Islets and foul ground lie between the island and Makilo, and between it and Traskon; it also extends about 3 miles eastward, protecting the anchorage eastward of Traskon. There are depths of 16.4 to 21.9 m (9 to 12 fms.), mud, in the anchorage.

Lights are shown from rocks close northward and southwestward of Makilo (Mäki-luoto) and also from islets close northeast-

ward and $\frac{1}{4}$ mile and $1\frac{1}{2}$ miles north-northeastward, respectively, of Porkkala.

A light for the use of pilot vessels is occasionally exhibited on an islet close southwestward of Porkkala.

Between Mäkilö and Örskär, about $12\frac{1}{2}$ miles northeastward, numerous islets, intermingled with foul ground, lie up to 3 miles off the peninsula projecting about 7 miles southwestward and patches of foul ground lie interspersed about 3 miles farther off these islets. The outermost dangers are: a 5.5 m (3 fm.) patch about 5 miles eastward of Mäkilö; a 3.6 m (2 fm.) patch about 5 miles southward and a 1.8 m (6 ft.) underwater rock about $2\frac{1}{2}$ miles south-southeastward, respectively, of Örskär.

From eastward, a fairway for 29-foot drafts lies about $1\frac{1}{2}$ miles offshore between the islands. The fairway is entered about $\frac{1}{2}$ mile southeastward of Stor Bredskär, about $2\frac{1}{4}$ miles westward of Örskär. Lights are shown from Grimsholm rocks, about $4\frac{3}{4}$ miles southwestward of Stor Bredskär. A pair of lights in range is shown on the western part of Stor Mickelskären, a group of islets about $1\frac{1}{4}$ miles east-northeastward of Grimsholm, and mark the fairway from Porkkala to Grimsholm. Range beacons and spar buoys mark the fairway according to the uniform system (sec. 1-13).

Esboviken, an inlet, is entered on either side of Stor Herrö, about $2\frac{3}{4}$ miles north-northwestward of Örskär, and Stor Pentala, close northward. It indents the coast about $5\frac{1}{4}$ miles in a northwesterly direction. A pair of beacons in range 346° is shown from the southwestern point of Ramsö, an island close eastward of Stor Pentala, and an islet $\frac{1}{4}$ mile southward of that point. These beacons mark the approach to the main fairway for 16-foot drafts entering the inlet. A 14-foot channel leads from the above range to a pier about $3\frac{1}{2}$ miles within the inlet. The fairways are marked according to the uniform system by spar buoys. Anchorage may be taken about $\frac{1}{3}$ mile northeastward of Stor Pentala in 6.4 to 11.9 m ($3\frac{1}{2}$ to $6\frac{1}{2}$ fms.), mud.

APPROACHES TO HELSINKI-DANGERS

3A-22 Helsinki Light ($59^\circ 57' N.$, $24^\circ 56' E.$) stands on a 10.6 m (35 ft.) shoal area about $12\frac{1}{2}$ miles southward of Helsinki. A fog signal is sounded and a radiobeacon and a radar beacon transmits from the light.

WESTERN SIDE.—A 10.3 m (34 ft.) patch, with a middle ground spar buoy on it, lies about $\frac{3}{4}$ mile west-northwestward of the latter light. A 33-foot patch lies about $1\frac{3}{4}$ miles northwestward of the light, and another 33-foot patch lies nearly $2\frac{3}{4}$ miles west-northwestward of the light. Shoal patches with a depth of 11 feet and 15 feet, each marked by a spar buoy, lie about 3 miles northwestward and north-northwestward, respectively, of the light. A 9.7 m (32 ft.) patch, marked by a spar buoy, lies about $4\frac{3}{4}$ miles west-southwestward of the light.

Graskarsbadarne are two closely grouped islets about $5\frac{1}{3}$ miles north-northwestward of the afore-mentioned light. From the islets, foul ground extends in patches about 2 miles southwestward through $4\frac{1}{2}$ miles westward and 4 miles northwestward to the islands lying offshore. A light is shown on Graskarsbadarne.

SHOALS.—A 9.1 m (30 ft.) shoal lies about $1\frac{1}{4}$ miles northeastward of Graskarsbadarne. Two shoals, with depths of 2.7 and 3.6 m (9 and 12 ft.) and marked on the eastern side by spar buoys, lie about $2\frac{1}{4}$ miles northeastward of the islet. A (4.5 m ($2\frac{1}{2}$ fm.) shoal, also marked on the eastern side by a spar buoy, lies about $1\frac{1}{4}$ miles farther north-northeastward. A 8.5 m ($4\frac{3}{4}$ fm.) rocky patch lies about midway between the latter shoal and two former shoals.

EASTERN SIDE.—Svartbada, with the islet of Bandarn close eastward, lies about 2 miles south-southeastward of Harmaja, described below. A beacon stands on the rock. A rock, with a depth of 1.5 m (5 ft.), lies on an extension of foul ground about $\frac{1}{3}$ mile southwestward of Svartbada. Rocky patches, with depths of 5.8 to 7.6 m ($3\frac{1}{4}$ to $4\frac{1}{4}$ fms.), the latter marked by a spar buoy, lie about $1\frac{1}{4}$ to $1\frac{3}{4}$ miles southwestward of Svartbada. Rocky patches of $3\frac{1}{2}$

and 4 fathoms lie about 1 mile farther southward and are marked with spar buoys.

Sitini, a $4\frac{1}{2}$ -fathom shoal located about $3\frac{1}{4}$ miles southward of Svartbåda, is marked by a spar buoy.

Harmaja (Gråhara) ($60^{\circ}06' N., 24^{\circ}59' E.$) lies about $3\frac{1}{4}$ miles south-southeastward of Helsinki. A light is shown and a fog signal is sounded from the island. The lighthouse is equipped with a radiobeacon. The main approach fairway lies between the light located about $5\frac{1}{3}$ miles south-southeastward of Graskårsbadarne and Harmaja, and the dangers adjacent to it are marked according to the uniform system of buoyage (sec. 1-13).

This island has foul ground extending about 300 yards westward through northward; a spar buoy is moored on its northern end. A 7-foot shoal marked by a spar buoy lies about $\frac{1}{4}$ mile south-southwestward and a 3-fathom shoal lies about $\frac{1}{3}$ mile westward of the island. Uusimatala, with depths of $2\frac{1}{2}$ to $4\frac{1}{4}$ fathoms and spar buoys moored on the northern and southern ends, lies about $\frac{3}{4}$ mile south-southeastward of the island. A 32-foot patch lies on the eastern side of the fairway about $\frac{1}{2}$ mile east-northeastward of Harmaja. A $4\frac{1}{4}$ -fathom shoal with a spar buoy moored on it lies between the island and Lågharu, an islet about $\frac{3}{4}$ mile north-eastward. Spar buoys are moored at the northwestern and southern end of the foul ground extending about 300 yards northwestward and southward from this islet.

Western approach.—Kytö, an island group, lies about $2\frac{1}{2}$ miles north-northeastward of Örskär on foul ground about 1 mile long and $\frac{1}{2}$ mile wide; a spar buoy is moored on its northeastern edge. A light is shown on a northern islet of the group. A tower stands on the largest island. Lights in range $056\frac{1}{2}^{\circ}$ are located on the southern group of islets.

Berggrund, a rock in the middle of the foul ground patches extending about $3\frac{1}{2}$ miles south-southeastward from Örskär, lies about $3\frac{3}{4}$ miles southward of Kytö. A disused lighthouse stands on Berggrund. A $3\frac{3}{4}$ -fathom patch lies about $1\frac{1}{2}$ miles southward of Berggrund.

A light is shown on Stor Bredskar and Segelkobben, located about $2\frac{1}{4}$ miles west-northwestward and $1\frac{1}{2}$ miles northwestward, respectively, of Örskar. A light is also located on Systrar, an islet about $1\frac{1}{4}$ mile southward of Segelkobben.

Ryssankari (Rysakari) lies about $3\frac{2}{3}$ miles northeastward of Kytö. A tower is located on the western side of Ryssankari.

Hamngrund is the center of an island group about $1\frac{1}{4}$ miles east-northeastward of Trutkubb. Katajaluoto and Langskar lie close southward of Hamngrund. Pihlajasari lies about 2 miles northward of Hamngrund. Melkki lies about $\frac{1}{2}$ mile southwestward of Pihlajasari and Melkohall lies about 300 yards southeastward of Melkki. Foul ground patches surround these islands and lie between Trutkubb and Ryssankari and extend southwestward from Trutkubb. These patches are marked by buoys on their fairway sides. Lights are shown from Kytö, Trutkubb, Katajaluoto, Langskar, Hamngrund, Melkohall, and Pihlajasari. The fairway between these dangers is available for vessels of a 29-foot draft and with local knowledge.

Directions for western fairway.—Upon leaving Porkkalanselkä and having passed about $\frac{1}{2}$ mile southeastward of Stor Bredskar steer a northeasterly course to about $1\frac{1}{4}$ mile south of Systrar. The channel with an authorized draft of 29 feet turns northward, passing between Systrar and an 8-foot shoal, marked on its western side by a spar buoy. The channel then continues east-northeastward with the lights on Segelkobben and Stor Bredskar in range 239° astern, to a point northwestward of Kytö Light. A shorter route, authorized for a draft of 18 feet, passes between the buoys marking the shoal patches about $1\frac{1}{4}$ miles southwestward of Kytö. Thence round Kytö to northward where it rejoins the 29-foot draft channel, and steer 073° with the lights on Trutkubb and Hamngrund in range to a position southward of Ryssankari. Thence steer south of Trutkubb on a course of $095\frac{1}{2}^{\circ}$ between several shoals marked by spar buoys. Next pass between Katajaluoto and Langskar, and northwestward of Harmaja to join the main approach channel. For an alternative channel, authorized for a draft of 26 feet, steer 042° between the buoys marking the edges of the foul ground patches between Ryssankari and Trutkubb. Thence pass between Melkohall and Pihlajasari and steer into the outer anchorage of Helsinki.

ANCHORAGES

3A-23 Hanko.—See section 3A-12.
 Tammisaari.—See section 3A-17.
 Stor Jussarö.—See section 3A-19.
 Pikkalafjärd.—See section 3A-21.
 Porkkala.—See section 3A-21.
 Esboviken.—See section 3A-21.

Part B. HELSINKI TO LOVIISA**HELSINKI (HELSINGFORS)**

Position: 60°10' N., 24°58' E.
Depths: Main approach fairway, 5½ to 14½ fathoms.
 Harbor channels, 1½ to 5 fathoms.
 Southern harbor, 13 to 34 feet.
 Northern harbor, 8 to 22 feet.
 Sornainen, 11 to 31 feet.
 Western harbors, 6½ to 32 feet.
 Berths, 10 to 34½ feet.
Port plans: See section 3B-10.

3B-1 The port of Helsinki is located about 20 miles northeastward of Porkkalaud off a projection of the mainland between two inlets of the coast. The harbor area comprises the two inlets. The city of Helsinki occupies the projection.

NAVIGATION

3B-2 From westward: a course of 064° for about 21 miles leads from a position on the coastal track about 5¾ miles south of Porkkalan Kallbåda (sec. 3A-21), in Porkkalanselkä, to a position about 2 1/3 miles southward of Helsinki Light.

From eastward: a course of 271° for about 20 miles leads from a position on the coastal track about 5 miles south of Kalbådagrund (sec. 3B-15) to about 2½ miles southward of Helsinki Light located about 5 1/3 miles south-southeastward of Gråskärsbådarne.

These courses lead over depths greater than 20 fathoms and clear of all dangers.

NAVIGATION SEASON

3B-3 The middle of April to the middle of February during average winters. Ice breakers keep the port open as long as possible.

DEPTHS

3B-4 The main approach fairway has depths of 5½ to 14½ fathoms from Helsinki Light to Eteläsatama, the southern harbor, proceeding between Vallisaari, to eastward, and Iso Mustasaari and Susisaari, to westward. The inshore fairway from Porkkalan-selkä is available for 29-foot drafts to Eteläsatama. The channel from Harmaja to Laajasala oil harbor is available for vessels with maximum drafts of 31 1/2 feet. The fairway has a depth of 19 feet up to the wharf at Iso Mustasaari and 12 feet to the outfitting pier. A fairway for 28-foot drafts leads to Heita-lahti, another for 26-foot drafts leads to Ruoholanti, and another for 8-foot drafts leads to Lapinlahti, passing through the bridge connecting Lauttasari to the harbor.

Kruunuvuorenselkä has general depths of 6 to 9½ fathoms. There are depths of 7½ to 14 fathoms in the outer road, southwestward of Susisaari. A fairway with a least depth of 20 feet leads from Eteläsatama to Sornainen and another with a least depth of 23 feet leads into Pohjoissatama. Vanhankaupunginselkä, northward of Kulosaari and entered through a lift bridge connecting that island with the harbor, has general depths of 8 to 16 feet; there are loading piers on the western shore. A channel for 26-foot drafts leads to the oil pier at Herttoniemen in the northeastern part of Kruunuvuorenselkä.

The fairway approaching the harbor between the off-lying islands eastward is available for 24-foot drafts and leads through the roads northward of Isosaari. There are general depths of 5½ to 13½ fathoms in the roads. A post, with a light and radar reflector on it, marks the northern side of the 24-foot channel about 1½ miles northeastward of Harmaja Light.

The water level is raised by strong southwesterly winds from October through December and lowered by northeasterly winds from April through June.

LANDMARKS

3B-5 The principal landmarks in the approach to Helsinki are: Nikolai Church, on Iso Mustasaari, visible about 22 miles; the church with two tall spires in the southern

part of the city; and the lighthouse on Harmaja. The Helsinki Observatory with three spires and the other buildings in the city are visible a great distance seaward.

HARBOR

3B-6 The harbor area of Helsinki consists of several natural harbors lying on either side of the peninsula on which lies the city of Helsinki. The inlets lying on either side of the peninsula are full of islands and shoals and are shallow in their northern parts. Many of the islands are connected by bridges. Laajalahti, the western inlet, is separated from the main harbor area by bridges between the mainland and Lauttasaari and is entered through the bridge on the eastern side of the island. Vanhankaupunginselkä, the northern part of the eastern inlet, is separated from the main harbor area by bridges between the mainland and Kulosaari and is entered through the swing bridge westward of the island.

Långör, an islet, lies about $1\frac{1}{4}$ miles north-northwestward of Harmaja. Foul ground extends about $\frac{2}{3}$ mile east-northeastward to Västergrund, a 6-foot shoal on the western side of the main approach fairway. Spar buoys mark the northern, the southern and the eastern limits of Västergrund. Östergrund, a 5-foot shoal, lies about $\frac{3}{4}$ mile eastward of Långör on the eastern side of the fairway. Four spar buoys mark this danger. Tiirakari, an islet, lies about 1 mile westward of Långör. Foul ground lies within 1 mile northward of the island and between the two islets and Hamngrund, about $1\frac{1}{3}$ miles south-southwestward.

Eteläsatama, on the southeastern side of the main peninsula, is formed by the peninsula on its southwestern side and Katajanokka extending about $\frac{2}{3}$ mile eastward on its northeastern side. Pohjoissatama lies northward of Katajanokka and is formed on its northern side by a mole extending 500 feet eastward to an islet about $\frac{1}{4}$ mile northward of Katajanokka. An inlet, crossed by two bridges, indents the peninsula about 1 mile in a westerly direction close northward of Pohjoissatama.

Several islands lie in the entrance of Esteläsatama and extend southeastward to Iso Mustasaari. Between Katajanokka and Kulosaari, about 1 mile northeastward, there are several islands between which a fairway leads to Sornainen. Sornainen lies about 1 mile northward of Katajanokka. The swing bridge between Kulosaari and the mainland is in the northern part of Sornainen.

Herttniemen lies on the mainland about $1\frac{1}{2}$ miles eastward of Sornainen in the northern part of Tuurholmanselkä. Degerö (Laajasala), a large island, lies close southward and with the islands lying up to $1\frac{1}{2}$ miles farther southward forms the eastern side of the harbor of Helsinki. Kruunuvuoronselkä lies between Degerö and the islands lying southeastward and northeastward of Katajanokka.

Merisatama, a yacht harbor, lies on the southern end of the peninsula. There are depths of 5 to 18 feet. A rock, with a depth of 6 feet and surrounded by foul ground, lies on the northern side of the fairway to the western harbors about $\frac{1}{3}$ mile southward of the western entrance to Merisatama.

Pihlajasaari lies about 1 mile southwestward of Merisatama. Foul ground with several islets lie within $\frac{1}{3}$ mile northward, eastward, and southward of the island. Fairways between the eastern and western harbors and from the western approach fairway lie on all sides of the island. The limits of the dangers are marked by spar buoys.

Hietalahti is entered about $\frac{1}{2}$ mile westward of Merisatama. A mole extends about $\frac{1}{3}$ mile south-southwestward from the eastern side of the harbor to the island of Heresaarenkari. Shoals with depths of 14 to 19 feet extend about $\frac{1}{2}$ mile southeastward from the island and lie on the northeastern side of the fairway.

Ruoholahti lies immediately west-northwestward of Hietalahti and is separated from it by Jätkäsaari, which extends about $\frac{1}{2}$ mile southward and southwestward from the mainland. Lapinlahti lies about $\frac{1}{3}$ mile

farther northward and indents the peninsula about $\frac{1}{2}$ mile. The swing bridge crossing to Lauttasaari lies between the harbors. Several harbors with loading places for light draft vessels lie farther northward and north-westward.

Navigational aids.—A light is shown on the dome of Nikolai Church on Iso Mustasaari. This light in range $007\frac{1}{2}^\circ$ with Harmaja Light mark the fairway from Helsinki Light. Another pair of lights in range 010° is shown from the southeastern ends of Iso Mustasaari and Susisaari and mark the fairway between Harmaja and eastward of Susisaari. Two lights in range 027° are shown on Santahimina (Sandhamn) island to mark an alternate fairway north of Malmgrund shoal (near the pilot station) to a point about $\frac{3}{4}$ mile southeastward of Harmaja Light. From there the light on the southeastern end of Iso Mustasaari and Renmarholmen Light, located about $\frac{3}{4}$ mile south of Mustasaari light, in range 357° mark the fairway to just south of Renmarholmen Light, where the fairway leads back into the main channel. A pair of lights in range 151° is shown about 700 yards westward of Nikolai Church.

A pair of lights in range 271° is shown from islands close southward and southwestward of Långör and mark the fairway from the eastern approach to the harbor.

Lights and beacons are shown in various parts of the harbor and mark the various fairways to the eastern and western harbors. Lighted buoys and spar buoys marked in accordance with the uniform system of buoyage are moored on the sides of the fairways and on shoal spots.

A signal station stands on Vallisaari.

Submarine cables (sec. 1-34) lie between most of the islands in the harbor and the approaches. Vessels should avoid anchoring in their vicinity. A submarine water pipeline extends from the southwestern extremity of Santahamina to the northern coast of Isosaari.

Anchorage.—There is anchorage in 7 to 12 fathoms, sand and stones, in the road northward of Isosaari, an island located about 2 miles eastward of Harmaja. Anchorage can also be taken in the road southwestward of Susisaari in 8 to 13 fathoms, mud and stones. These are suitable temporary anchorages; the former having poor holding ground and the latter being open to onshore winds. Kruunuvuorenselkä affords the best anchorage in $6\frac{1}{2}$ to 9 fathoms, mud. This anchorage is well protected from all winds. A 6-foot shoal, marked by buoys, lies in the middle of the northern part of the road about $\frac{1}{2}$ mile east-southeastward of Katajanokka; a 5-fathom shoal and a $4\frac{1}{4}$ fathom shoal lie about $\frac{1}{4}$ mile northwestward and southwestward of the 6-foot shoal.

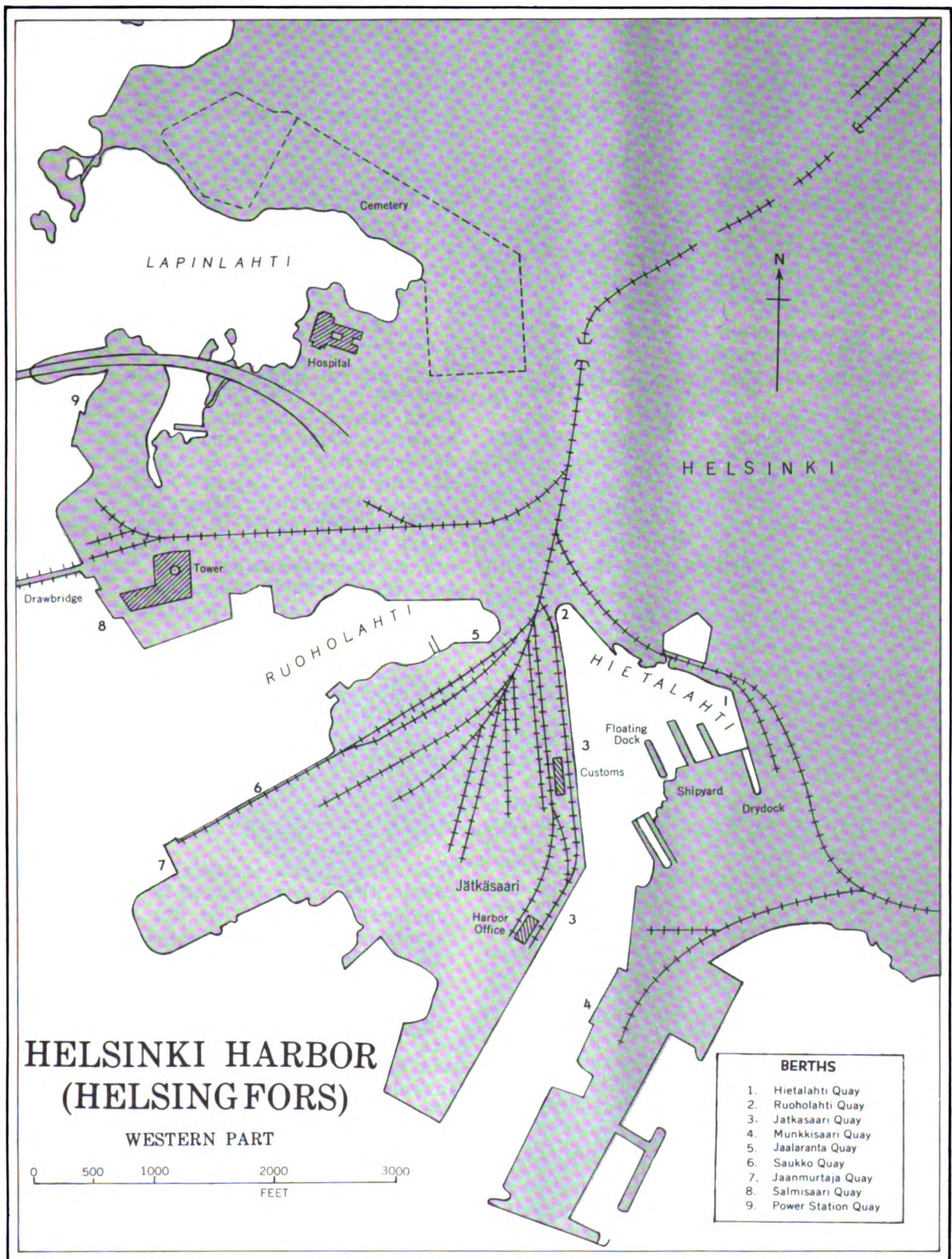
SIGNALS—REGULATIONS

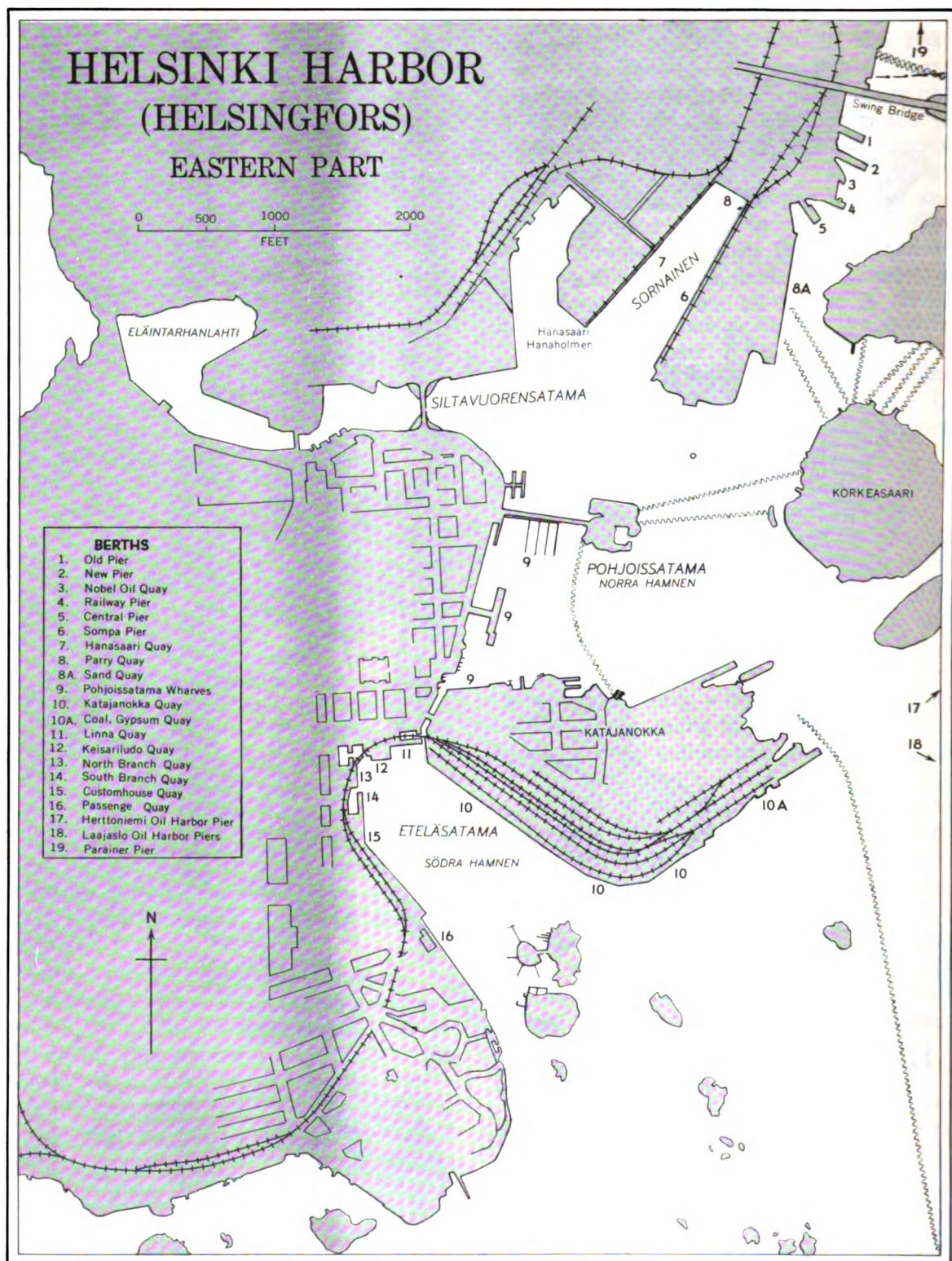
3B-7 The following is a summary of the harbor regulations: A vessel should hoist her national ensign upon arrival in the outer harbor. Anchorage is not permitted in the fairways. Speed in the inner harbor shall not exceed 4 knots. Vessels may not berth alongside a pier or quay without permission. A vessel carrying more than $18\frac{3}{4}$ pounds of gunpowder or 69 gallons of combustible liquid as cargo must fly a red flag by day or show a red light at night. These vessels must remain in the outer harbor anchored at least 200 yards from the shore or other vessels.

A vessel's arrival must be reported without delay, or if the harbor office is closed, not later than noon of the following day. The amount of gunpowder or combustible liquid and whether an infectious disease is on board must be reported before a berth is assigned.

PILOTS

3B-8 Pilotage for merchant and naval vessels is compulsory. Pilots are stationed at





Harmaja and at Hylkysaari, an island about 1/4 mile northeastward of Katajanokka.

If a vessel draws more than 29 1/2 feet, or its length is more than 525 feet, or its registered tonnage exceeds 18,000, it can be piloted through the fairway between Susisaari and Vallisaari only during daylight and with the aid of a strong tow.

If the length of a vessel is over 660 feet, or the registered tonnage is over 25,000, it cannot be piloted through the above fairway, even though the vessel draws less than 31 1/2 feet; under these circumstances the vessel must anchor off Iso Mustasaari.

DIRECTIONS FOR ENTERING

3B-9 Approaching Helsinki by the main approach fairway, steer 007 1/2° with the light on Nikolai Church and Harmaja Light in range, passing about 700 yards eastward of Helsinki Light (sec. 3A-22) and about 300 yards eastward of Harmaja. Thence with the lights on the southeastern ends of Iso Mustasaari and Susisaari in range 010° steer on that range between Lagharu and the 5.5 m (3 fm.) shoal close southwestward to the entrance of Kruunuvuorenselkä which lies between Susisaari and Vallisaari.

FACILITIES

3B-10 HELSINKI, comprising an old and new city, stands on the peninsula between the eastern and western harbors. It is the capital of Finland and the largest commercial and industrial city in the country. In 1966 it had a population of 507,000.

The United States is represented by a legation.

BERTHS.—Etelasatama: Katajanokka Quay has 3,660 feet of berthing space with depths of 7 to 9.5 m (23 to 31 1/4 ft.) alongside. Cranes of 3- to 6-ton capacities are available.

Linna Quay has a berthing length of 315 feet with a depth of 2.9 m (9 3/4 ft.) alongside. Keisarihuoto Quay has a berthing length of 245 feet with depths of 1.6 to 2.9 m (5 1/2 to 9 3/4 ft.) alongside. These berths are located at the head of the harbor and are used by the coastal passenger steamers.

North Branch Quay has a berthing length of 260 feet with depths of 2.4 to 3.9 m (8 to 13 ft.) alongside.

South Branch Quay has a berthing length of 250 feet with a depth of 5.9 m (19 1/2 ft.) alongside.

Customhouse Quay has a berthing length of 520 feet with a depth of 5.9 m (19 1/2 ft.) alongside.

Passenger Quay has a berthing length of 2,170 feet with depths of 5 to 7.4 m (16 1/2 to 24 1/2 ft.) alongside. Cranes of 1 1/2 to 5 tons capacity are available.

Pohjoissatama is a naval harbor with depths of 3.6 to 6.1 m (12 to 20 ft.) at the berths. There is an 18-ton crane and a 22-ton sheer legs.

Sornainen: Coal Wharf has a berthing length of 590 feet with a depth alongside of 5.5 m (18 ft.).

Hanasaari Quay has a berthage of 1,680 feet, with a depth of 8.9 m (29 1/2 ft.) alongside. A 150-ton stationary crane, two 100-tons per hour bridge cranes, and six 6-ton cranes, 4 of which are for discharging coal only.

A 360-foot pier with an alongside depth of 7.9 m (26 ft.) is under construction northward of Hanasaari Quay.

Parru Quay has a berthing length of 400 feet with a depth of 8 m (26 1/4 ft.) alongside.

Sompa Pier has a berthing length of 1,270 feet with a depth of 7 m (23 ft.) alongside. An additional length of 655 feet of berthing space was under construction in 1966.

Central Pier has a berthing length of 395 feet with depths of 3.9 to 5 m (13 to 16 1/2 ft.) alongside.

Railroad Pier has a berthing length of 245 feet with depths of 4.4 to 5 m (14 3/4 to 16 1/2 ft.) alongside.

Nobel Oil Quay has a length of 164 feet with a depth along the outer end of 6.7 m (22 ft.).

New Pier has a berthing length of 510 feet with depths of 4.6 to 5.4 m (15 1/2 to 17 3/4 ft.) alongside.

Old Pier has a berthing length of 530 feet with depth of 4.4 to 5.2 m (14 3/4 to 17 1/4 ft.) alongside.

Parainen Pier has a berthing length of 330 feet with a depth of 5.4 m (17 3/4 ft.) alongside.

Herttoniemi Oil Harbor Pier has a berthing length of 630 feet with a depth of 8.5 m (28 ft.) alongside.

Laajasalo Oil Harbor Piers have berthing lengths of 60 to 190 feet with depths of 5.5 to 10.3 m (18 to 34 ft.) alongside. These piers are privately owned.

Hietalahti: Hietalahdenranta has a berthing length of 540 feet with depth of 6.4 to 7 m (21 1/4 to 23 ft.) alongside.

Ruoholahdenranta Quay has a berthing length of 580 feet with depths of 3.3 to 5.9 m (11 to 19 1/2 ft.) alongside.

Jatkasaari Quay has 2,990 feet of berthing length with depths alongside of 3.4 m (11 1/2

ft.) at the inner end and 5 to 9.4 m (16 1/2 to 31 ft.) elsewhere. There are several cranes of 1 1/2 to 6 tons capacity. A 25-ton stationary crane is also available.

Munkkisaarenranta Quay has a berthing length of 710 feet with depths of 7.6 to 8.2 m (25 to 27 ft.) alongside.

Ruoholahti: Jaalaranta Quay has a berthing length of 520 feet with a depth of 3.9 m (13 ft.) alongside.

Saukonranta Quay has a berthing length of 1,490 feet with depths alongside of 5 m (16 1/2 ft.) at the inner end to depths of 9.1 m (30 ft.) at the outer end. There are several cranes of 5 to 10 tons capacity.

Jaamurtaja Quay has a berthing length of 240 feet with depths of 5 to 7 m (16 1/2 to 23 ft.) alongside.

Salmisaari Quay has a berthing length of 390 feet with depths alongside of 1.9 m (6 1/2 ft.) at the northern end and 7.4 to 8.6 m (24 1/2 to 28 1/2 ft.) at the southern end.

Salmisaari Power Station Quay has a berthing length of 300 feet with a depth of 7.9 m (26 1/4 ft.) alongside.

Extensive construction, in various stages of completion, is in progress throughout the port area (1964).

All berths herein described and the loading places in Vanhankaupunginselka, except the berths in Pohjoissatama, are served by the railroad. Tugs and ice breakers are available. A pneumatic grain unloader, a cement conveyor system, and coal conveyor system each with a capacity of 100 tons per hour are available.

SUPPLIES.—Deck and engine supplies and provisions are available in unlimited quantities (1947). Bunker coal is available and delivered at several of the berths and at the anchorage by lighter. Fuel oil and diesel oil are available. Water is piped to all berths and is also delivered by water barges.

REPAIRS.—Repairs of all kinds to hull and machinery can be handled in the harbor. There are two drydocks, three floating drydocks, and three marine railways in the Hietalahti shipyard; the largest drydock has a maximum length of 465 feet; breadth of entrance, 65 1/2 feet; depth over sill, 21 1/2 feet. The largest floating drydock has a capacity of 12,000 tons. A 5-ton stationary crane and a 75-ton and a 10-ton travelling crane serve the shipyard. A 10, 20 and 50 ton floating crane is also there. Divers are available.

COMMUNICATIONS.—There is a radio station in Helsinki. Telegraph, telephone, bus, and railroad service to the other cities of

the country and Leningrad is available. Airlines and passenger steamers maintain schedules to European countries and the United States. There is a regular scheduled car/passenger ferry service between Helsinki and Travemunde.

DERATIZATION.—See section 1-7.

MEDICAL.—Three hospitals are available for seamen.

COAST—GENERAL

3B-11 Between Helsinki and Loviisa the coast trends irregularly east-northeastward about 43 miles. It is hilly, wooded, and fronted by numerous rocks and islands up to 13 miles offshore. Inshore fairways lead between these dangers but local knowledge is essential. The harbors of Porvoo and Loviisa are of commercial importance along this stretch of coast.

DEPTHS—DANGERS

3B-12 The 20-fathom curve, within which are detached dangers, lies up to 16 miles offshore. Within this 16-mile limit, the depths are very irregular.

KALBADAGRUND (Kallabadagrund), a 1.8 m (6 ft.) reef, lies about 20 miles eastward of Helsinki Light.

A 9.1 m (5 fm.) rocky patch, with a spar buoy moored on its southern side, lies about 4 miles east-southeastward of Kalbadagrund Light. A 5.8 m (3 1/4 fm.) patch lies about 4 1/4 miles eastward of the same light.

DIGSKAR (Tiiskeri) (60°10'N., 26°16'E.), a rock surrounded by foul ground, is the outermost danger in the approach to Loviisa and lies about 17 miles southward of it. A light is shown on the rock.

NAVIGATION

3B-13 Traffic separation lanes have been established southward of Kalbadagrund and can best be seen on the chart. From the position about 5 1/4 miles southward of Helsinki Light (sec. 3A-4), a continuation of the 076° course for an additional 45 miles joins the 071° course of the offshore track (sec. 2-2) about 10 miles west-northwestward of Ruuskeri (sec. 2C-3). This course leads in depths greater than 37 m (20 fms.) and passes about 2 1/2 miles south of Kalbadagrund Light and 1 mile south of the 9.1 m (5 fm.) rocky patch about 4 miles east-southeastward of it.

COASTAL FEATURES

3B-14 SODERSKAR (60° 07' N., 25° 25' E.), a group of rocky islets, lie about 13 miles eastward of Harmaja. Foul ground and islets lie within 1 1/2 miles northwestward and northeastward of the islets. A LIGHT is shown on one of the islets on the southern side of the Soderskar group.

BETWEEN HARMAJA AND SODERSKAR, the outermost dangers beside Sitini (sec. 3A-22) are: a 9.1 m (5 fm.) spot about 5 1/2 miles southeastward of Harmaja; another 9.1 m (5 fm.) spot about 2 miles farther eastward; westward of Soderskar; a 8.6 m (28 1/2 ft.) patch about 6 miles southwestward of Soderskar; and a 7.6 m (25 ft.) patch about 4 3/4 miles south-southwestward of Soderskar. The 8.6 m (28 1/2 ft.) patch is marked by a spar buoy. Vastra Balkan, a 0.9 m (3 ft.) shoal, and Sodra Balkan, a 9.4 m (5 1/4 fm.) shoal marked by a spar buoy, lie 3 1/4 and 3 1/2 miles southwestward of Soderskar Light.

A fairway for 29 1/2-foot drafts lies about 4 miles offshore and leads between the islands fronting this coast. This fairway is marked by lighted and unlighted ranges and the adjacent dangers are marked by buoys according to the uniform system (sec. 1-13), but local knowledge is essential. It is joined west-southwestward of Pirttisaari by a fairway leading westward of this island and the adjacent group and the Soderskar group.

PIRTTISAARI (Porto) HARBOR lies between the island of Basto, about 2 1/4 miles northward of Soderskar, and Pirttisaari, close northeastward. This small but well-sheltered harbor is available to 10-foot drafts. SVARTVIK, a larger harbor available to 18-foot drafts, lies on the northeastern side of Pirttisaari and has the island of Bodo close northward. A BUOYED CHANNEL leads to the anchorage. The dangers adjacent to the fairways leading to these harbors are marked by BUOYS according to the uniform system. There is a custom station for the loading places in the vicinity. A LIGHT is shown occasionally from a rock in the middle of Svartvik.

Submarine cables lie southeastward of Pirttisaari.

A channel, for drafts of 20 feet, leads from north of Tallorn northeastward then northward, and marked by two sets of range lights,

to the anchorage in a depth of 12.8 m (7 fms.) off Kalkkitechdas.

APPROACHES TO PORVOO—DANGERS

3B-15 Kalbadagrund Light is located close southward of the southern end of Kalbadagrund, about 9 1/2 miles southeastward of Soderskar. A radiobeacon, radar beacon and fog signal are located at the light. A 8.2 m (4 1/2 fms.) shoal, marked on its southern side by a spar buoy, lies about 1/2 mile southward of the light.

A 9.1 m (5 fms.) spot, marked on its eastern side by a buoy, exists about 4 1/2 miles north-northwestward of the light.

STOR KOLHALL lies about 7 miles east-southeastward of Soderskar. Patches of foul ground lie within 1 mile southward through southwestward, between the islet and Kolhall, an islet about 1 1/4 miles northward, and thence between that islet and Brunskar, about 2 1/4 miles farther northeastward. Range lights with a radar beacon are located on Brunskar. A 9.1 m (5 fms.) patch lies about 1 1/2 miles westward of Kolhall.

ORSKAR lies about 3 miles northwestward of Brunskar. Islets and foul ground extend about 1/2 mile westward through 1 2/3 miles southward from the island. A BEACON is located on Orskar. Range lights marking the entrance channel are shown on Kalskar (Kalskar) which lies about 2 miles south-southwestward of Orskar. Foul ground lies between the islands and within 1/2 mile southward and 1 mile eastward of Kalskar. An 8.2 m (4 1/2 fm.) patch marked on its fairway side by a spar buoy lies on the eastern side of the fairway about 2/3 mile westward of Orskar.

VORONINA, a 6.7 m (3 3/4 fms.) rock, lies on the western side of the fairway about 5 miles south-southeastward of Soderskar. A 10.3 m (5 3/4 fm.) shoal is located about 2 miles southwestward of Voronina. Ostra Stambej, a 6.4 m (3 1/2 fm.) shoal, lies about 2 1/2 miles westward of Kolhall. Kalskarsgrund, a 6.4 m (3 1/2 fm.) shoal, lies about 1 1/2 miles westward of Kalskar; a 7.6 m (4 1/4 fms.) spot lies about 3/4 mile south-southeastward. These dangers are marked by spar buoys. A buoy marks the southern side of an 8.2 m (4 1/2 fms.) spot about 1 3/4 miles east of Soderskar Light.

STENORN (60° 11' N., 25° 34' E.), an island, lies about 1 2/3 miles west-northwestward of Orskar. A light is shown on the island. TWO SPAR buoys are

moored on the northern edge and one SPAR BUOY is moored on the eastern edge of the foul ground that surrounds the island. A 6.4 m (3 1/2 fms.) rocky patch lies on the western side of the fairway midway between the latter islands and is marked by a spar buoy; a 7.6 m (4 1/4 fm.) shoal lies close northwestward. A 5.5 m (3 fm.) shoal, marked by a spar buoy, lies about 1 1/4 miles southward of Stenorn; patches of foul ground lie within 1 mile west-southwestward through northwestward of this shoal. Two beacons stand on Stenorn and a light is shown on the island.

AGGSKAR, an island about 4 1/2 miles northeastward of Orskar, has foul ground and islets extending north-northwestward about 2 miles. Between Orskar and Aggskar are numerous patches of foul ground with depths of 2.1 to 5.8 m (1 1/4 to 3 1/4 fms.). These patches lie on the southern side of the fairway and the outermost are marked by spar buoys. A light is shown on Aggskar.

The approach fairway which is available for drafts of 24 feet leads northward between the dangers described above, passing westward of Kalbadagrund Light and between Orskar and Stenorn. Thence it divides: one fairway continues northward and joins a channel available for 42 1/2-foot drafts as far as Tolkkinen Roads; the other fairway which is available for drafts of 24 feet leads east-northeastward towards Aggskar, rounds Hakasalo (section 3B-16) and thence continues north-northwestward between Emasalo and Vessolandet. A 5.5 m (3 fm.) shoal marked by a buoy lies on the northern side of the latter fairway about 2 miles north-northeastward of Orskar.

THE WESTERN APPROACH, available for 24-foot draft vessels, leads westward of Soderskar and Pirttisaari, passing close westward of Kajholm, an island 1 mile northwestward of Basto. Thence the fairway leads northeastward in various reaches and joins the channel for 42 1/2-foot drafts about

3 miles south-southwestward of Tolkkinen. Another fairway available for 21-foot drafts leads from a position westward of Graskar in an easterly direction and joins the channel for 24-foot drafts about 1 1/2 miles south-southwestward of Emasalo. The channel between Tolkkinen Roads and the dock at Tolkkinen is authorized for a draft of 23 feet.

These fairways are marked by Lighted Buoys, Spar Buoys and Range Beacons. Although well lighted and fairly deep, these fairways should not be used without local knowledge.

PORVOO (Borga)

Position: 60°24'N., 25°40'E.

Depths: Main approach fairway, 11.9 to 40 m (6 1/2 to 22 fms.).

Loading places, 6.4 to 16.4 m (3 1/2 to 9 fms.).

Anchorage, 6.4 to 16.4 m (3 1/2 to 9 fms.).

Harbor channel, 2.7 to 3.6 m (9 to 12 ft.).

Wharves, 1.5 m (5 ft.)

3B-16 Porvoo lies at the mouth of a river about 24 1/2 miles northeastward of Helsinki. The river discharges into Porvoonselka, the head of an inlet that indents the coast about 9 miles.

NAVIGATION.—From the coastal track, about 2 3/4 miles south-southwestward of Kalbadagrund Light, a course of 355° passes about 1 mile westward of Kalbadagrund to a position about 1 3/4 miles southward of Ostra Stambej. This course clears all dangers, and passes over depths greater than 46 m (25 fms.) to the intersection of the range beacons shown from Havsudd, the southwestern end of Emasalo.

A channel, authorized for a draft of 42 1/2 feet, leads from seaward, 2 miles westward of Kalbadagrund light, in a north-northeasterly direction to about 1 3/4 miles eastward of Kalskar Light. It then passes between Emasalo and Kalfon to Skoldvik oil harbor and Tolkkinen roads.

voo according to the uniform system. Range beacons mark the recommended courses. Three pair of lights in range are shown near the river mouth and a pair of lights in range 014° is shown about ½ mile northward of Tolkkinen.

Anchorage can be taken westward of Haksalo in 7.3 to 12.8 m (4 to 7 fms.), mud. Off Tolkkinen there are depths of 10.9 to 14.6 m (6 to 8 fms.), mud. The usual anchorages are off the loading places of Hamari and Haikko in 2 to 3 1/4 fathoms, mud, and in Orrenkylänselkä, off Orrenkylä, in 11.9 to 14.9 m (6 1/2 to 8 1/4 fms.), mud and sand.

Pilots.—Pilotage is compulsory. Pilots can be obtained at Helsinki or the pilot station on the southern extremity of Emäsalo (sec. 3B-16) if using the fairways through the islands. Björkholm is the station for out-bound vessels. Pilots meet vessels from seaward about 3 miles north-northwestward of Kalbadagrund Light (sec. 3B-15).

Directions for entering.—From the position about 1¼ miles southward of Östra Stambej, a course of 011½° leads close eastward of that shoal and between the dangers extending westward from Örskär and eastward from Stenörn. This course leads about 7¼ miles with the beacons on Havsudd in range ahead. Thence when the beacons on Stenörn and Algskär, an island about 1 mile west-southwestward, are in range 249½°, steer 069½° with this range astern. When southward of the cairn on the southeastern end of Haksalo, alter course gradually to north-northwestward, passing a safe distance off the eastern side of that island.

When eastward of Haksalo, steer a north-northwesterly course, being guided by the navigational aids to Orrenkylänselkä, the outer loading place of Porvoo. A channel, marked in accordance with the uniform system of buoyage and ranges, leads from the

northern part of Orrenkylänselkä to the river mouth.

3B-17 Porvoo is a town with a population of about 11,300 (1960) on the eastern side of Porvoo River. There is a wharf with a depth of 1.5 m (5 ft.) alongside. Vessels usually anchor at Haikko and load from lighters. Tolkkinen has about 853 feet of wharfage portions of which have a depth of 6.7 m (22 ft.) alongside. Water and fresh provisions are obtainable and small repairs can be undertaken. One tug is available.

There is regular steamer service to Helsinki. The railroad connects with the loading places and the general system.

COASTAL FEATURES (Continued)

3B-18 Pelling (Suur Pellinki) (60° 12' N., 25° 50' E.) lies about 1¼ miles south-eastward of the southeastern end of Ves-sölandet. It is the largest island of a group fronting the mainland for about 7 miles eastward. Rocky and shoal patches extend about 13½ miles southward from the island and terminate in the 9.1 m (5 fm.) shoal about 4 miles east-southeastward of Kalbadagrund.

A lifeboat is maintained on Glosholm, close southward of Pelling.

Fairways with controlling depths of 23 and 24 feet lead eastward and southward of the islands and thence branch to lead northward through the eastern part of the islands and northeastward of Våtskär where they rejoin and lead east-northeastward to Boistö. A fairway with a least charted depth of 6 feet leads through the northern part of the islands. These fairways although well-marked by buoys, beacons, and lighted ranges should not be traversed without local knowledge.

Lill Pernåvik, a loading place of Porvoo, is the inner part of an extensive inlet of the mainland entered through the eastern part of the Pelling islands. Sarvsalö is a large island in the outer part of the inlet and divides it into two parts.

Våtskär, an island close southeastward of the mainland extending southeastward between Lill Pernåvik and Pernåvik, lies about 3 miles eastward of Sarvsalö. A harbor, with an entrance for 12-foot drafts, lies close southeastward of the island and is formed on its western side by the island of Hästö, close southward of Våtskär.

Pernåvik, entered about 3 miles northward of Våtskär, extends about 11 miles northwestward. This inlet is encumbered by numerous islets and shoals, but a fairway available for 18-foot drafts and marked according to the uniform system of buoyage leads along the northeastern part to Pernå, a loading place of Loviisa, about 6 miles from the entrance. A fairway, authorized for a draft of 14 feet, branches westward about 2 1/4 miles southeastward of Perna to a loading place in Isnåsvik, about 2 1/4 miles southwestward of Perna.

Kajvsalö (Kejvsalo), a large island in the middle of the entrance to Pernåvik, extends southeastward about 3 miles. Foul ground and islets extend about 2 3/4 mile farther southeastward. Deep fjords lie on either side of the island, and fairways to Pernå lead through them. The dangers are marked by **buoys**. **Beacons** in range 267 1/2° stand on islets about 1 mile eastward of the southeastern extremity of Kajvsalö and lead through the eastern fairway over a least depth of 7.3 m (4 fms.) between the dangers extending southeastward from Kajvsalo and southward from Hudö. The inner fairway from the Pelling passes southward of the dangers of Våtskär and those off Kajvsalö and Hudö, and northward of the islands of Hamnholmar (Hamnholm) and Skarven. **Lights** are shown from Hamnholmar and Skarven.

APPROACHES TO LOVIISA—DANGERS

3B-19 Digskär, the outermost danger on the western side of the approach to Loviisa, is described in section 3B-12. Gåsörn, an island, lies about 3 1/2 miles west-northwestward of Digskär. Skarvgaddarna Light is shown on a rocky islet off the northwestern corner of Gasörn. Vesikivi Light, located

about 2 1/2 miles north-northwest of Digskär Light, lies in range 72 1/2° with Skarvgaddarna Light. Patches of foul ground extend about 3 miles southeastward to an 8.2 m (4 1/2 fm.) spot and also lie between Gasörn and Hamnskar, about 3 3/4 miles north-northeastward of Digskär. A light is shown on Gaddarna about 5 1/4 miles west-southwestward of Digskär. A 10.3 m (5 3/4 fm.) spot lies about 5 miles east-southeastward of Gaddarna.

Hamnskar is a low bare islet from which a light is shown occasionally. Foul ground patches extend about 1 1/3 miles east-southeastward to a 4.9 m (2 3/4 fm.) spot and also lie between that spot and Orregrund, about 5 miles northeastward of Hamnskar. A 7.6 m (4 1/4 fm.) spot, located about 2 2/3 miles south-southwestward of Orregrund and marked by a spar buoy, is the southeastern extremity of these patches. A 9.1 m (5 fm.) shoal, marked by a spar buoy, lies about 1 1/2 miles farther north-northeastward. The latter two shoals lie on the western side of the approach fairway to Loviisa.

A 10.3 m (5 3/4 fm.) shoal lies in the approach to Loviisa about 4 2/3 miles east-southeastward of Digskär.

Tainio Light is located on a 4.9 m (2 3/4 fm.) shoal on the eastern side of the fairway in a position about 4 miles south-southeastward of the eastern end of Orregrund. A fog signal is sounded at the light. A spar buoy is moored close westward of the light. Foul ground lies up to 1 mile eastward and 1 1/2 miles southeastward of the light. An unmarked shoal with depths of 8.2 to 10.9 m (4 1/2 to 6 fms.) lies about 3/4 mile north-eastward of the light. A 9.4 m (5 1/4 fm.) patch marked by a spar buoy lies on the eastern side of the fairway about 2 miles southward of the eastern end of Orregrund.

Orregrund is a low sparsely wooded island. It is steep-to on its western side, but foul ground extends about 1/2 mile southeastward from the island. The island of Båksör lies on this foul ground. A buoy marks the southern extremity of this danger. Many dangers lie within 1 1/2 miles northeastward of the island. A light is shown from the western end and a pair of lights in range 023° is shown from the eastern end of the island. A radio-beacon transmits and a fog signal is sounded on Orregrund. A line-throwing apparatus is maintained on the island.

Västra Båkländet Light is shown about $\frac{1}{2}$ mile westward of Orrengrund and a light is shown from Lalatta, an islet about 3 miles east-northeastward of Orrengrund.

A light is shown on Östergrund about 1 mile northeastward of Orrengrund.

Ljusan (Ljusaro) lies about 2 miles north-northeastward of Orrengrund and Boistö lies about $1\frac{1}{4}$ miles farther north-northeastward. Foul ground lies between Boistö and Ljusan. Fairways lie between the islands and the foul ground and between Ljusan and the dangers northeastward of Orrengrund. Two pair of lights in range are shown from Ljusan and mark the fairway leading westward between the islands from Kotka.

Kärnersgrund, a $2\frac{1}{2}$ -fathom shoal marked with a spar buoy, lies about 1 mile northward of Orrengrund. A $3\frac{1}{2}$ - and $3\frac{3}{4}$ -fathom shoal, each marked with spar buoys, lie about $\frac{1}{2}$ mile southeastward and southwestward and two $4\frac{3}{4}$ -fathom patches lie about $\frac{3}{4}$ mile westward, respectively, of Kärnersgrund. Fjårdsgrund, a $4\frac{1}{2}$ -foot shoal marked with a spar buoy, lies about $1\frac{2}{3}$ miles northwestward of Orrengrund. Detached patches of foul ground lie between this shoal and Skarven Light, about $1\frac{1}{3}$ miles farther northwestward, and also between the shoal and Hamnskär.

Stor Tåktaren ($60^{\circ}20' N.$, $26^{\circ}22' E.$), with Yttre Tåktaren close southward, lies about $4\frac{1}{4}$ miles northwestward of Orrengrund. Foul ground patches extend up to $1\frac{2}{3}$ miles southeastward from the island where they are marked with two spar buoys. Patches of foul ground also lie up to 1 mile eastward and between Stor Tåktaren and Stora Rövaren, about $\frac{1}{2}$ mile northward. Range lights and beacons are located at various places on these islets and shoals and mark the fairways leading between them; light and spar buoys mark the adjacent shoals of the fairways.

Hudö, a low wooded island, lies about $1\frac{2}{3}$ miles westward of Stor Tåktaren and extends about $1\frac{3}{4}$ miles northwestward. Lill Hudö lies close southeastward and is surrounded

by foul ground up to $\frac{1}{2}$ mile off. Foul ground extends about $1\frac{1}{4}$ miles eastward from the southeastern extremity of Hudö. Shoals with depths of $1\frac{1}{2}$ to 2 fathoms lie within about $1\frac{1}{4}$ miles eastward to east-northeastward of the northern point of the island; a spar buoy is moored on the east-northeastern shoal.

A pair of lights in range 288° is shown from the northern part of Hudö and leads through the fairway from Boistö and its junction, northward of Stor Tåktaren, with the main approach fairway from Orrengrund.

A pair of beacons in range $318\frac{1}{2}^{\circ}$ stands on the northeastern side of Hudö and marks the fairway from Orrengrund to the junction of the fairway that leads through the dangers extending southeastward from Kajvsalö and southward from Hudö.

LOVIISA (LOVISA)

Position: $60^{\circ}27' N.$, $26^{\circ}14' E.$

Depths: Anchorages, 3 to 8 fathoms.

Fairway to Valkom, 24 feet.

Valkom to Loviisa, 20 to 9 feet.

Valkom, 16 to 24 feet.

Harbor, 4 to 10 feet.

Berths, 6 to 9 feet.

3B-20 Loviisa lies at the head of Lovisaviken and includes the facilities of Valkom, which lies on the western shore of the inlet, about 2 miles southward.

Navigation.—**From westward:** From a position on the coastal track about $10\frac{1}{2}$ miles eastward of Kalbådagrund a course of 051° for about 17 miles leads to a position about $3\frac{1}{4}$ miles eastward of Digskär.

From eastward: From a position on the coastal track about $6\frac{1}{4}$ miles northward of Ruuskeri (sec. 3B-13) a course of 308° for about $11\frac{1}{2}$ miles leads to a position about $3\frac{3}{4}$ miles east-northeastward of Digskär.

These courses lead clear of all dangers, pass over depths greater than 14 fathoms, and terminate on the line of the range lights shown from Orrengrund.

Navigation season.—End of April to the beginning of December. Ice breakers keep the port open as long as possible.

Currents.—Currents are similar to those of Tammisaari which are described in section 3A-17.

Depths.—The charted depths in the fairway between Digskär and Stor Tåktaren are 8 to 22 fathoms. Thence a fairway for vessels of 24-foot drafts leads to the entrance of Lovisaviken. Between Hudö and the entrance, except for the shoals described in section 3B-19, there are depths of 7 to 11 fathoms. The entrance to Lovisaviken is shoal and encumbered with dangers; a 24-foot fairway leads between them to Valkom. The fairway was being dredged to a depth of 26 feet in 1960. Eastward of Valkom, there are depths of 6 to 7¼ fathoms and thence the inlet shoals gradually to 1 foot at the river that empties into the head of the inlet. A fairway with a least charted depth of 14 feet leads to the harbor and thence a depth of 9 feet to the Customs Pier.

Harbor.—Lovisaviken is entered about 2 miles northward of Hudö and extends about 4¾ miles north-northwestward. The shores are low, wooded, and foul for the most part. Vårdöh, an island about 1¾ miles northward of the northern end of Hudö, and Svartholm, about ¾ mile southeastward of Vårdöh, are the western and eastern entrance points. Foul ground, through which is a fairway marked by spar buoys, extends across the entrance. Monäs is a town on the eastern side of the inlet about 1 mile northeastward of Valkom.

Navigational aids.—Range lights are shown from Svartholm, Fantsnäs, close northward of Vårdöh, Monäs, and a pair of islets on the eastern side of the inlet off Loviisa. A pair of lights in range 327° is shown on the Customs Pier at Loviisa. Buoys and beacons also mark the fairways and adjacent dangers.

Anchorage can be taken in 8 fathoms, mud, about ½ mile southwestward of Svartholm; in 6 fathoms, mud, about ½ mile northeastward of Valkom quay; in 3 fathoms, mud, about ¾ mile south-southeastward of the

Customs Pier at Loviisa. Vessels anchor at the latter two places to load by lighters.

Pilots.—Pilots meet vessels from seaward southward of the pilot station on Orrengrund. Pilots for the inner fairways may be obtained at Pellinge. The pilot station in Lovisaviken is located about 2½ miles southward of Loviisa.

Directions for entering.—Approaching Loviisa from seaward, steer 023° on the range shown from the eastern side of Orrengrund, passing westward of Tainio Light (sec. 3B-19) and close eastward of the spar buoy marking the 4¼-fathom spot about 1 mile northward. Thence when southward of Orrengrund, steer 336° on the range shown from Stora Rövaren, which leads between Orrengrund and the spar buoy marking the 4½-foot spot about ½ mile westward and passes close eastward of the spar buoy marking the southeastern extremity of the foul ground extending from Stor Tåktaren. When eastward of Stor Tåktaren, the buoyed fairway is entered and the alinements of the various ranges lead to Loviisa.

3B-21 Loviisa and Valkom, with populations of 4,000 and 3,700, respectively, in 1950, are towns on the western side of Lovisaviken. The principal industry is lumbering. Valkom, the outport of Loviisa, has 312 feet of berthing space for drafts of 18 feet along the western side of Etelä Laituri (South Quay); 427 feet of berthing space for drafts of 24 feet along the eastern side of Etelä Laituri; 443 feet of berthing space for drafts of 24 feet alongside Viistolaituri (Connection Quay); and 525 feet of berthing space for drafts of 10½ feet alongside Vällilaituri (Middle Quay). Work is in progress (1963) to increase the total berthing space available at Vällilaituri to 919 feet. Construction of more berthing space is being planned at Hiililaituri (Coal Quay). Loviisa has a 260-foot pier with a depth of 9 feet alongside and a 130-foot pier with a depth of 6 feet alongside. There are two automotive cranes of 2 1/2- and 4-ton capacity, a 1 1/2-ton traveling crane, and a 6-ton portal crane in Valkom. Tugs and covered lighters are available at Valkom.

Fuel oil and supplies are available in limited quantities. Fresh provisions are obtainable and water is delivered by water boat. Small repairs can be made on vessels machinery.

There is railroad connection with the general system, Loviisa, and the quays at Valkom. Telegraphic and coastal steamer communication with Helsinki and Leningrad is regular.

A hospital in the town will receive seamen.

ANCHORAGES

3B-22 Helsinki.—See section 3B-6.

Soderskar.—In 16.4 to 21.9 m (9 to 12 fms.), mud and sand, northward of the southern group of islands. Vessels of 18-foot drafts can enter.

Svartvik.—In 8.2 to 13.7 m (4 1/2 to 7 1/2 fms.), clay, for vessels not exceeding 18-foot drafts.

Porvoo.—See section 3B-16.

Vatskar.—In 9.1 m (5 fms.), clay, for 12-foot drafts.

Perna.—In 5.5 to 9.1 m (3 to 5 fms.) mud, about 1 mile southward of the village. In 10.9 m (6 fms.), mud, about 2 miles farther southeastward.

Loviisa.—See section 3B-20.

Part C. LOVIISA TO HAMINA

3C-1 Boisto (60°20'N., 26°30'E.) is a small, sparsely-wooded steep-to island. A light is shown on the island. A submarine cable (sec. 1-34) lies between the island and Orrengrund. Foul ground extends between Lehtinen, an island close northeastward, and Vinberggrund, a 4.5 m (2 1/2 fm.) shoal, about 2 miles southeastward. A spar buoy is moored on the shoal and on the dangers adjacent to a fairway between the shoal and the foul ground. Lights are shown from two islands on the foulground about 1/2 mile south-southeastward and 3/4 mile northward of Boisto, and an island close southeastward of Lehtine. A light is shown from Vinbergshall, an islet about 1 1/2 miles southeastward of Boisto. A light is shown from an islet about 1 1/2 miles southward of Vingersdhal. A light is shown on Pitkaviira, an islet about 4 3/4 miles southeastward of Boisto.

COAST—GENERAL

3C-2 The coast between Loviisa and Hamina, about 29 miles east-northeastward, is densely wooded, as are several of the islands fronting it, and it is indented by a number of inlets. The islands are not as thickly clustered as the coast westward. The principal ports are Kotka and Hamina.

DEPTHS—OFFSHORE DANGERS

3C-3 The 20-fathom curve lies about 13 miles offshore westward of Ostrov Sur-Sari (sec. 2C-4). Thence the depths are irregular and the dangers extend to within 2 miles northwestward of Ostrov Sur-Sari, about 20 1/2 miles southward of Kotka. Depths greater than 37 m (20 fm.) lie among some of the dangers between Ostrov Sur-Sari and Kotka and Hamina harbors approaches.

Pitkaviira, an island, lies about 5 1/2 miles east-northeastward of Orrengrund (sec. 3B-19). A light is shown on its southwestern extremity.

Luojerunnit (Luodematalat), a bank with depths less than 18.3 m (10 fm.) and consisting of stones and gravel, extends about 4 3/4 miles north-northwestward from Meririutta, an 8.2 m (4 1/2 fm.) spot about 13 miles southeastward of Orrengrund and about 7 miles westward of Ostrov Sur-Sari. A chain of 5.5 to 9.1 m (3 to 5 fm.) spots lie on the bank and extend about 2 miles northward from Meririutta; the least depth on the bank, 1.8 m (6 ft.), marked by a spar buoy, lies about 1 3/4 miles farther northwestward. **Valdstein**, a 9.1 m (5 fm.) shoal, lies about 2 miles northwestward of the northern end of the bank and a 7.3 m (4 fm.) shoal lies midway between them.

A 7.3 m (4 fm.) shoal, marked by a spar buoy, lies about 2 1/4 miles northwestward of the northernmost point of Ostrov Sur-Sari; another 7.3 m (4 fm.) shoal lies about 2 3/4 miles farther northwestward.

Luppi (60°14'N., 27°02'E.) is the outermost of the islands extending about 5 1/2 miles southwestward from Haapasaari, described with the harbor approaches to Kotka and Hamina in section 3C-6. A light is shown on Luppi. **Reippo** lies about 1 1/4 miles westward of Luppi. Banks, with depths less than 18.3 m (10 fms.) and underwater rocks and rocks awash, extend 6 1/4 miles southwestward to the 7.3 m (4 fm.) shoal described in the previous paragraph.

A light is shown on Luppi Island.

Tuomola, a 7.6 m (4 1/4 fm.) shoal, lies about 3 1/4 miles southward of Haapasaari

and is the outermost danger of the approach. A spar buoy is moored on the shoal.

Inner fairways for drafts of 24 and 29½ feet lead through the dangers about 4 miles offshore from Boistö to Kotka and Hamina. Dangers adjacent to the fairways will be described with the coastal features.

NAVIGATION

3C-4 See sections 2-2, 3B-18, and 3D-4.

COASTAL FEATURES

3C-5 Abborfjärd indents the coast about 5 miles in a northerly direction about 5 miles northeastward of the entrance of Lovisaviken. The entrance, about 3½ miles wide, is narrowed to ½ mile by two large irregularly-shaped islands about 4½ miles long. Vaahterpää extends southeastward on the western side of the entrance to within ⅞ mile northeastward of Boisto. Munapirtti (Morgenporto) extends northeastward from about 1 mile northward of the southeastern part of Vaahterpää. Svartholm lies in the entrance close northward of the southeastern end of Vaahterpää.

A fairway for 24-foot drafts leads to an anchorage close eastward of Svartholm and thence a fairway for 18-foot drafts leads through the entrance to a loading anchorage between the northwestern part of Munapirtti and the mainland about 1½ miles westward. A 10-foot fairway leads to a loading anchorage about 1½ miles from the head of the fjord, where the towns of Lill Abborfors and Stor Abborfors lie on either side of the river emptying into the fjord. The fjord is shoal and filled with numerous dangers, but the fairway is marked by spar buoys. Bisapall is an islet that lies a little over 1 mile southeastward of Vaahterpää. A 2.7 m (1 1/2 fm.) patch lies about 1 mile north-northeastward of Bisapall.

Keihassalmi is a loading place on the coast close northeastward of Munapirtti and about 1 mile within the passage between that island and the coast. The passage is foul, but vessels of 22-foot draft can approach the anchorage of 9.1 m (5 fm.) about 1/2 mile southeastward. Another anchorage with

depths of 10.9 to 14.6 m (6 to 8 fms.), mud, is located about 1 mile farther southeastward, and can be approached by vessels with a draft of 29 1/2 feet. A pair of lights in range 316° is shown from the inlet to Keihassalmi and leads to the buoys marking the fairway.

Between Munapirtti and Kotka, about 12 miles east-northeastward, islands and foul ground extend up to 3¼ miles from the southern side of Munapirtti and the coast. The outer dangers are marked by spar buoys and fairways for 24- and 29½-foot drafts lead southward of them between Loviisa and Kotka. A light is shown on Mossholm, an island about 2¾ miles west-northwestward of the northern extremity of Kaunissaari. Rädhäll, a rock, is situated about ½ mile east-southeastward of Mossholm.

A submarine cable (sec. 1-34) lies between Byö, an island at the eastern entrance to Abborfjärd, and Kaunissaari.

Kaunissaari (60°22' N., 26°46' E.) lies about 4¾ miles southeastward of Keihassalmi and about 1 mile southward of the dangers extending offshore. The northern side of the island, adjacent to the fairway, is rather steep-to, but foul ground with islands on it extends about 3¼ miles southeastward from the island. A light is shown on the northern end of the island. Shoals with depths of 4.9 to 8.3 m (2 3/4 to 4 1/2 fms.) lie about 1 1/2 to 2 miles westward of the western side of the island and there are depths of 5.5 to 6.7 m (3 to 3 3/4 fms.) between 2/3 mile eastward and northeastward of the light; spar buoys are moored on them. A 9.1 m (5 fm.) shoal lies about 2 miles east-northeastward of the light.

Kalliakari is located about 1¾ miles southwestward of the southern end of Kaunissaari. A light is shown occasionally. Islands and patches of foul ground lie interspersed between this islet and Orrengrund, about 10 miles west-southwestward.

APPROACHES TO KOTKA AND HAMINA—DANGERS

3C-6 Haapasaari (Äspo) (60°17' N., 27°12' E.) is the middle of a group of islands

about 17 miles southward of Hamina. The fairways to Kotka and Hamina are entered through this group. The larger islands are partly wooded and moderately high; the smaller are low and bare. A beacon, a signal mast, and the white customhouse stand on the western part and a white church stands on the eastern part of the island. A light is shown on Kivikari, a rock close northeastward of the island.

A submarine cable (sec. 1-34) crosses the fairway about $\frac{3}{8}$ mile eastward and $\frac{1}{8}$ mile westward of the island.

A lifesaving station is maintained on the island. Haapasaari is a custom station for the loading places of the harbors. Pilots may be obtained by giving at least 6 hours notice to Hamina pilot station.

The island group surrounding Haapasaari extends about 5 miles eastward through about $2\frac{1}{2}$ miles northward to about 5 miles northwestward from that island. It includes the islands between Haapasaari and Luppi (sec. 3C-3), about $5\frac{3}{4}$ miles southwestward, and the islands lying within about $1\frac{3}{4}$ miles southward through about $2\frac{1}{2}$ miles southeastward of Haapasaari. Lights are shown on Veitkari and Kuuttalpetäjäinen, about $1\frac{2}{3}$ miles southeastward and $1\frac{1}{4}$ miles northwestward of Haapasaari, and also on Vahakari, about 4 miles northwestward of Haapasaari. Tuomola, the outermost danger in the approaches to Haapasaari, is described in section 3C-3.

Kuutsalo and Kirkkomaansaari are two large islands within a group of islands and foul ground extending about 9 miles south-southeastward from the eastern side of Kotka to within $5\frac{1}{4}$ miles northwestward of Haapasaari. Patches extend about $1\frac{1}{4}$ miles farther southeastward with spar buoys moored at the northern and southern ends. A cairn stands on Merikari, an islet in the middle of these patches. Stony patches with depths of 4.5 to 9.1 m ($2\frac{1}{2}$ to 5 fms.) lie about 1 mile eastward of the islet; a spar buoy is moored on the southern side.

Rankki (Rankkinsaari), an island, lies about 4 miles southward of Kotka and about $2\frac{1}{2}$ miles westward of the southern end of Kirkkomaansaari. Foul ground surrounds its southern end about $\frac{1}{4}$ mile off and extends with islets about $2\frac{1}{3}$ miles north-northwestward to within $\frac{3}{4}$ mile southeastward of Mussalo. A light is shown on the foul ground close southward of the southern end of the island. A pair of beacons in range $301\frac{1}{2}^\circ$ stands on islets close eastward and $\frac{1}{2}$ mile northwestward of Rankki. A spar buoy is moored on the southern end and the northern end of the foul ground.

Retonpaasi, a rock awash on which a light is shown, lies about $1\frac{1}{2}$ miles eastward of Rankki Light.

A light is shown near the northern end of a reef, with a least depth of 2.7 m ($1\frac{1}{2}$ fms.) about 1 mile south-southwestward of Rankki; a spar buoy is moored on its northern edge. A spar buoy is moored on a 8.2 m ($4\frac{1}{2}$ fms.) shoal about $2\frac{1}{3}$ miles westward of Rankki. Detached shoals of 6.7 to 7.6 m ($3\frac{3}{4}$ to $4\frac{1}{4}$ fm.) lie between that shoal and a 1.2 m (4 ft.) shoal about 1 mile southward.

Lellerinsaaret, a group of three islets and foul ground patches extending to the westward, is located about $1\frac{1}{2}$ miles north-northeastward of Rankki. A light is shown on the easternmost of the islets. A 5.5 m (3 fm.) and a 1.8 m (1 fm.) shoal, each marked by spar buoys, lie about $\frac{1}{3}$ mile northwestward and northward of the light.

Sikina, with a least depth of 0.9 m (3 ft.), lies about $\frac{3}{4}$ mile northeastward of Rankki Light; four spar buoys are moored around the shoal. Detached 3.6 to 7.3 m (2 to 4 fm.) shoals, with two spar buoys moored on their eastern side, lie between Sikina and Lellerinsaaret.

Heitakari, located about 1 mile eastward of Lellerinsaaret, stands on the foul ground that lies about $\frac{1}{2}$ mile off the western sides of Kirkkomaansaari and Kuutsalo. A light is shown from the islet. Lehmäsaari lies on

that foul ground about $\frac{1}{2}$ mile north-northwestward of Heitakari and extends about $1\frac{1}{4}$ miles northward. A pair of beacons in range $356\frac{1}{2}^\circ$ stands on its western sides. Detached shoals of 5.5 to 9.1 m (3 to 5 fm.) and marked by spar buoys lie between 1 mile westward to southwestward of the northern point of the island. A rocky patch, with depths of 3.9 to 5.5 m ($2\frac{1}{4}$ to 3 fm.) and marked by a spar buoy, lies about $\frac{2}{3}$ mile westward of the latter shoal.

3C-7 Fairways.—Fairways for 24-foot drafts pass on either side of Haapasaari and join about $\frac{1}{2}$ mile northward of that island. This fairway trends northwestward toward Rankki and thence north-northwestward between that island and Kirkkomaansaari to Kotka. About 1 mile northward of Kuuttalpetäjaine, a branch of this fairway leads between the dangers described in the following paragraph to Hamina. Another branch of this fairway leads north-northeastward from Haapasaari to Kuorsalo (sec. 3D-1). A fairway with a controlling depth of $29\frac{1}{2}$ feet leads eastward from Boistö to Kotka and Hamina. Northward of Kaunissaari, a branch of this fairway leads to Kotka, passing close southward of Mussalo. The other branch of the fairway leads east-southeastward, passing northward of the detached dangers westward and southward of Rankki, and between Kirkkomaansaari and Merikari. Thence, it divides again; one branch trends east-northward, rounding the dangers about $7\frac{1}{2}$ miles southeastward of the harbor entrance of Hamina, and then leads northwestward to the harbor entrance, passing between the off-lying dangers and those extending from the shore of the mainland; the other branch trends generally northward to Hamina. Spar buoys mark the dangers adjacent to the fairways according to the uniform system (sec. 1-13).

Suur Musta ($60^\circ 27' N.$, $27^\circ 10' E.$) lies on the eastern side of the generally north trending fairway to Hamina, about $3\frac{3}{4}$ miles southward of the harbor entrance and eastward of the northern end of Kuutsalo. A light and a

beacon, on the western side of the island, in range mark the fairway passing westward of Savinnonmatala, the western most shoal, about $1\frac{1}{4}$ miles north-northwestward of the island. Sovinnonmatala is marked by a light. A range formed by a beacon on the southern end of the island and a similar beacon on an islet about $1\frac{1}{4}$ miles southwestward mark a fairway leading to Kotka, passing southward of Kirkkomaasaari. The fairway northward of Kuutsalo leading to Kotka is marked by lighted range beacons on Vehkaluoto, an islet lying about $1\frac{1}{2}$ miles westward of Suur Musta.

Foul ground with islands on it extends about $2\frac{1}{2}$ miles northward and lies interspersed up to $8\frac{1}{2}$ miles southward from the western point of Suur Musta. These dangers lie adjacent to the eastern side of the fairway and are marked by buoys according to the uniform system.

On the western side of the fairway, Kuolioluoto, the easternmost of the islands extending south-southeastward from Kotka, lies about $2\frac{3}{4}$ miles northeastward of the southern end of Kirkkomaansaari. Detached shoals, with depths of 0.9 to 6.4 m (3 to 21 ft.) and marked by spar buoys, lie interspersed within 1 mile southward and northeastward of the island. Several shoals lie between a 7.3 m (4 fm.) shoal marked with a spar buoy about $\frac{1}{2}$ mile westward of the western point of Suur Musta and a 4.5 m ($2\frac{1}{2}$ fm.) shoal marked by a buoy about $\frac{1}{2}$ mile southward.

Pakaskeri and Honkanen, with beacons in range marking the fairway northward of Kuutsalo, lie about 2 miles northwestward of Suur Musta. Detached shoals with depth of 3 to 10 m ($1\frac{3}{4}$ to $5\frac{1}{2}$ fm.) extend about $1\frac{1}{4}$ miles southeastward from the island and adjacent to the fairway. A spar buoy is moored on the southeastern extremity.

Hajaskari, a rock surrounded by foul ground to a distance about $\frac{1}{2}$ mile, lies about $1\frac{3}{4}$ miles northeastward of Pakaskeri and $1\frac{1}{2}$ miles southwestward of Hamina harbor entrance. A light on this rock in range $356\frac{1}{2}^\circ$ with a light on the mainland about 1 mile

northward marks the fairway westward of the foul ground southward of Suur Musta. A pair of lights in range 016° is shown on Hillonniemi, about 1 mile northeastward of Hajaskari, and mark the fairway between Hajaskari and the foul ground extending northward from Suur Musta.

Vähä Musta lies about $\frac{1}{2}$ mile southward of the middle of Hamina harbor entrance and about 3 miles northward of Suur Musta. Foul ground extends about $\frac{1}{3}$ mile northwestward and southward from the island. A small islet, with a cairn close northward, lies on the northwestern end of the foul ground. A pair of beacons in range 308 $\frac{1}{2}$ ° stand on the southern side of the island and an islet close southeastward and mark a stretch of the 8.9 m (29 $\frac{1}{2}$ ft.) fairway from Vestkari, the southeasternmost of the dangers extending from the harbor entrance.

KOTKA

Position: 60°28'N., 26°58'E.
Depths: Approach fairways, 10 to 33 m (5 $\frac{1}{2}$ to 18 fm.)
 Anchorages, 6.4 to 16.4 m (3 $\frac{1}{2}$ to 9 fms.)
 Harbor, 2.7 to 11.9 m (1 $\frac{1}{2}$ to 6 $\frac{1}{2}$ fms.)
 Channels, 1.8 to 8.9 m (6 to 29 $\frac{1}{2}$ ft.)
 Berths, 2.9 to 9.8 m (9 $\frac{3}{4}$ to 32 $\frac{1}{2}$ ft.).

Port plan: See section 3C-16.

3C-8 Kotka, separated into two parts by Kotka Island on which the main part of the town is located, lies about 19 $\frac{1}{2}$ miles east-northeastward of Loviisa. There is an eastern, western, and central harbor. The Kyminjoki empties on either side of the island.

NAVIGATION

3C-9 From westward: From a position about $\frac{1}{2}$ miles northward of Ostrov Sur-Sari (sec. 2-2) a course of 044° for about 10 $\frac{1}{4}$ miles leads to the pilot station southward of

Haapasaari about 1 $\frac{1}{2}$ miles southwestward of Veitkari. This course leads over a least charted depth of 10 fathoms and passes about $\frac{3}{4}$ mile northwestward of Tuomola.

FROM EASTWARD: From a position about 3 miles southward of Sommars (sec. 2C-6) a course of 297° for about 12 $\frac{1}{2}$ miles leads to about 1 mile southeastward of Veitkari. It leads over depths greater than 37 m (20 fms.) and passes close southward of the 18.3 m (10 fm.) patch about 5 miles east-southeastward of Veitkari.

NAVIGATION SEASON

3C-10 From the middle of April to the beginning of January, but the harbor is kept open as long as possible by ice breakers.

The quays at Kotka are kept ice free by an underwater compressed air system which prevents ice formation.

DEPTHS

3C-11 There are several shoal and foul areas scattered throughout Kotka harbor, but fairways, marked by lights, beacons and buoys, afford depths of 3.6 to 8.9 m (12 to 29 $\frac{1}{2}$ ft.) to the various berths of the harbor. The eastern harbor, on the eastern side of Hallansaari, the northern island of those extending south-southeastward from Kymi about $\frac{1}{2}$ mile northeastward of Kotka Island, has depths of 6.1 m (20 ft.) at the berth and 10.9 m (36 ft.) at the anchorage close eastward. The central harbor, which lies within the northern side of Kotka Island and Hovinsaari and Hallansaari, and includes the facilities of Sunila, affords depths of 1.8 m (6 ft.) in the booming grounds, 4.3 to 9.2 m (14 $\frac{1}{2}$ to 30 $\frac{1}{2}$ ft.) feet at the various berths, and up to 12.2 m (40 ft.) in the anchorage. The western harbor on the western side of Kotka Island and midway on the western side of Hovinsaari, has depths of 3.9 to 9.8 m (13 to 32 $\frac{1}{2}$ ft.) at the berths.

WATER LEVEL—CURRENTS

3C-12 The water level is affected greatly by the winds. Gales from south to southwest increase the water level of the harbor up to 0.9 m (3 ft.) above normal. Gales from northward decrease the level about 0.3 m (1 ft.).

The currents are inappreciable but since the Kyminjoki, one of the largest rivers flowing into the Gulf of Finland from the numerous inner lakes, empties into the harbor, the set is nearly always southward.

ASPECT—LANDMARKS

3C-13 The harbor lies at the seaward end of a heavily wooded valley formed by the Kyminjoki through the low land of the coast. From seaward the islands and the coast blend together, and the first landmarks to be sighted are the two chimneys of the cellulose factory and the water tower in the town.

HARBOR

3C-14 Kotka is entered between the northern end of Lehmäsaari and the foul ground and islets extending about $\frac{1}{2}$ mile southeastward from Mussalo, a large island that lies about $\frac{1}{2}$ mile offshore and extends about $2\frac{3}{4}$ miles southward about $2\frac{1}{2}$ miles westward of Kuutsalo. Kotka Island lies in the middle of the harbor and is connected to Hovinsaari at its northwestern point by a causeway. Hovinsaari extends north-northwestward about $2\frac{3}{4}$ miles into an inlet. It divides the western entrance of the Kyminjoki into two arms.

These large islands separate the harbor into the central and western parts. Both parts shoal gradually toward their heads. The facilities for large vessels lie on the northern part of Kotka Island. Berthing facilities are also scattered along the eastern part of the western harbor and at Sunila, in the northeastern part of the central harbor.

Kukouri and Kukourinkari are two islets on the eastern side of the harbor entrance and lie on the northern part of the foul ground that extends about $1\frac{1}{4}$ miles northward from Lehmäsaari. Shoals with depths of 2.7 and 6.4 m (1 $\frac{1}{2}$ and 3 $\frac{1}{2}$ fms.) lie within 1/2 mile northward of Kukouri, the northern islet. Spar buoys mark the fairway side of these shoals and foul ground.

Tuohipollo lies about $\frac{1}{3}$ mile southeastward of the eastern end of Mussalo and Havouri lies about $\frac{1}{3}$ mile farther eastward

and about $\frac{2}{3}$ mile southward of the southern point of Kotka Island. Detached shoals with depths of 2.7 to 7.9 m (9 to 26 ft.) lie interspersed between these islands. Varissaari lies about $\frac{1}{3}$ mile eastward of the southern end of Kotka Island. Foul ground with many above- and below-water rocks extends about $\frac{1}{2}$ mile north-northeastward and 1 mile southward from the islet. Spar buoys mark the fairway sides of these dangers.

Hallansaari lies about $\frac{1}{2}$ mile northeastward of Kotka and close off the mainland at Sunila. Islands extend about $1\frac{1}{4}$ miles southward to Pirköyri, an island about $\frac{3}{8}$ mile eastward of Kotka Island. These islands are steep-to on their western side, but foul ground extends about $\frac{3}{8}$ mile southward from Pirköyri and also extends southeastward from the group to Kuutsalo. Routsinsalmi, a buoyed and lighted channel dredged to 21 feet, passes southward of Pirköyri. A channel with a least depth of $9\frac{3}{4}$ feet passes northward of Hallansaari.

Hietanen lies in the middle of the central harbor; a small islet lies close southward of it. There are several piers for lighters on the island. An extensive booming ground lies between the island and Hovinsaari. Booming cribs lie off Sunila and the northwestern part of Hallansaari. Booming areas are also located within the islets northward of Hallansaari.

An overhead cable with a vertical clearance of 110 feet extends southward from Hietanen; spanning the channel between Hietanen and Kotka Island.

Kuusinen lies in the middle of the eastern fairway of Kotka harbor; foul ground surrounds the islet up to 200 yards off. Norssaari lies in the middle of the western fairway of Kotka harbor. The main fairways lie eastward of Kuusinen and westward of Norssaari.

Navigational aids.—Lights are shown from Kukourinkari, from a position on Kuutsalo about 1 mile northeastward, from a rock close southwestward of Pirköyri, and from the two rocks southeastward of Hietanen.

A pair of lights in range 015°, consisting of the light shown close southwestward of Pirkoyri and a light on Pirkoyri, marks the 29 1/2-foot fairway that passes eastward of Kuusinen. Another pair of range lights is shown from Norssaari and the southwestern part of Hovinsaari and marks the fairway into the western harbor. Range lights also mark the approach to the wharves on the northern end of Kotka Island.

Lighted ranges on the southern and southwestern sides of Kotka Island mark the 29 1/2-foot channel to the oil piers on the southwestern side of the island. The light on Kukourinkari and the one about 1 mile northeastward in range 056° mark the fairway for 29 1/2-foot drafts from Orrengrund, passing southeastward of Mussalo. A pair of lights in range 331 1/2° is located close northward of Hietanen and marks the fairway leading to Sunila.

A pair of beacons in range 320° stands close southward of Tuohipollo and on Mussalo, about 1/2 mile northwestward. These beacons mark the approach to the fairway of the western harbor. Beacons also stand on Kukouri, on the southwestern side of Kotka Island, and various places in the harbor. Spar buoys mark the numerous dangers adjacent to the fairways according to the uniform system.

SUBMARINE CABLES (sec. 1-34) lie between Mussalo and Kuutsalo. Cables also extend between Kotka Island and Hirssaari, Varissaari, Hietanen, and Hovinsaari.

ANCHORAGE can be taken by vessels with local knowledge eastward of the southern end of Kotka Island in 11.0 to 16.4 m (6 to 9 fms.), clay and mud; also in 6.4 to 11.0 m (3 1/2 to 6 fms.), clay and sand, sheltered from all winds, northward of the eastern end of the island. On the eastern side of Hallansaari there is anchorage for vessels with a draft of 20 feet in mud and stones. On the western side of Kotka Island, anchorage is available in 9.1 to 11.0 m (5 to 6 fms.), mud and clay. There are about five mooring berths throughout the harbor area which are used occasionally by vessels loading sawn timber. Vessels should not anchor in the vicinity of a submerged water pipe laid northeastward of the causeway joining Hovinsaari and the northwestern shore of Kotka.

Another submerged water pipeline extends southward from the southern extremity of Kotka to the northeastern point of Rankki.

Harbor regulations are available in English and vessels should obtain a copy on arrival.

PILOTS

Vessels from seaward may obtain pilots at Orrengrund, if using the 29 1/2-foot fairway. Vessels using the inner fairways may obtain pilots at Kuorsalo (sec. 3D-1) from eastward. The pilot station in Kotka is on the northern side of the harbor. Pilots may be obtained at Haapasaari by giving at least 6 hours notice to Hamina pilot station.

DIRECTIONS FOR ENTERING

3C-15 THE MAIN APPROACH to Kotka is from Haapasaari, and is available for vessels not exceeding 24-foot drafts. Approach from southeastward with Veitkari lighthouse and Haapasaari beacon in range 313 1/2° until within 2 1/2 miles of the former; thence steer 319° for Kivikari light structure, passing between the buoys marking the shoal extending about 1/4 mile northward from Veitkari and the shoal about 1/3 mile eastward. When about 1/2 mile southeastward of Kivikari, steer to pass between it and the northeastern side of Haapasaari, and thence to the anchorage northward of Haapasaari.

VESSELS FROM SOUTHWESTWARD may also, by day, approach by a buoyed fairway, passing westward of Haapasaari and the islands immediately southward of it. After passing northwestward of Tuomola, steer for Haapasaari beacon bearing 352°, passing about 300 yards westward of the spar buoy marking the 6.4 m (3 1/2 fm.) patch about 1 mile westward of Veitkari. Thence pass westward of Jarvenkari, an island about 2/3 mile southward of Haapasaari, and thence north-northwestward through the buoyed fairway.

From Haapasaari anchorage, steer a northwesterly course with Kivikari lighthouse bearing 139° astern until about 1 2/3 miles north-northwestward of Kuuttalpetajainen. From this position steer 292° for Rankki lighthouse, passing southward of the buoys marking the dangers off the southern end of Kirkkomaansaari. When about 1 3/4 miles

from Rankki lighthouse, alter course north-westward and steer 333° for Lellerinsaaret light structure, passing eastward of Sikina and the shoals south-southeastward of Lellerinsaaret. Thence steer to pass about 300 yards eastward of that light structure and between the several dangers marked by spar buoys. From here steer in on the 353 1/2° range formed by the chimney of the Sunila works and the tower of the Gutzeit works. When the Pirkoyri range lights are intersected westward of Kukouri islet, steer 015° on this range to the entrance of the central harbor.

If proceeding to the western harbor, Mus-salo and Tuohipollo beacons in range 322° will lead northward of Lellerinsaaret to within 2/3 mile of the latter islet. Thence the channels to the oil piers are marked by buoys and lighted ranges.

FACILITIES

3C-16 KOTKA, with a population of about 31,000 in 1963, is the principal export port and one of the largest manufacturing centers in Finland. The mouth of the Kuminjoki is a natural outlet for the manufacturing of the river valley. The principal exports are wood products, furniture, cellulose, and paper; the imports are coal, machinery and iron.

BERTHS.—Itälaituri: berthing length, 1,985 feet; depth alongside, 7.5 m (24 1/2 ft.) except at the inner part of the southern side where there is a depth of 6.6 m (21 1/2 ft.). Four 3-ton cranes are available.

Keskus Quay: berthing length, 1,410 feet; depth alongside, 7.6 m (25 ft.).

Kalaranta Wharf: berthing length, 815 feet; depths alongside, 4.4 to 6.3 m (14 1/2 to 20 1/2 ft.).

Vasikkasaari Quay: berthing length, 1,100 feet with a project depth alongside of 9.4 m (31 ft.). Bulk cargoes of coal, salt and gypsum are handled. Four 8-ton cranes are available. The entrance channel to the pier is being dredged to a depth of 8.4 m (27 1/2 ft.) (1965).

Vessels of greater drafts load by lighters in the outer anchorages.

Sunila Quay: berthing length, 1,400 feet; depths alongside, 5.1 to 8.2 m (16 1/2 to 27

ft.). A 6-ton crane is located on the pier. There are numerous 3- and several 5-ton cranes. A tunnel connects the quay with the warehouse and the plant. Cargo is moved to the quay by forklifts via the tunnel.

Hallansaari Quay: berthing length, 450 feet; depth alongside, 2.9 to 7.0 m (9 3/4 to 23 ft.). Vessels of greater draft load by lighter at the anchorage close eastward.

Enso-Gutzeit Quay, on the eastern point of Kotka Island: berthing length, 330 feet; depth alongside, 5.5 m (18 ft.). This berth is used by self-propelled barges from Lake Ladoga.

Hillilaituri: Berthing length, 885 feet; depths alongside, 6.2 to 7.3 m (20 1/2 to 24 ft.). Two 5-ton and two 3-ton cranes for handling coal are on the pier.

Vallilaituri Pier: berthing length, 1,670 feet; depths alongside, 6.2 to 9.2 m (20 1/2 to 30 1/2 ft.). Cranes available; four 3-ton, two 5-ton, one 8-ton and one 60-ton.

Harniemen Quay: berthing length, 1,280 feet; depths alongside 5.9 to 7.6 m (19 1/2 to 25 ft.). Four 3-ton cranes serve the pier.

Oil Piers have depths of 4.5 to 9.5 m (15 to 31 1/2 ft.) alongside the north side of the southernmost pier and alongside the south side of the pier located 80 feet north of the root of the southernmost pier. Least depths of 9.8 m (32 1/2 ft.) lie off the heads of these piers. Old Oil Pier has a berthing length of 70 feet.

Superphosphate Factory Pier: berthing length, 510 feet; depth alongside, 5.2 to 7.0 m (17 to 23 ft.). There is a loading and discharging elevator and a 3-ton crane on the pier.

Flour Mill Pier: berthing length, 495 feet; depth alongside, 6.4 m (21 ft.). There is a grain elevator with a discharging capacity of 30 tons per hour.

Railroad Oil Pier: berthing length, 430 feet; depth alongside, 4.9 m (16 ft.).

Chalk Factory Pier: berthing length, 130 feet, depth alongside, 2.7 m (9 ft.).

Sugar Refinery Pier: berthing length, 490 feet. It is reported (1965) that the alongside depth is 3.6 m (12 ft.) but the pier is in disrepair and no longer used.

Mussalo Power Station Quay: berthing length; about 600 feet, coke and coal for the

power station is discharged here. A conveyor system from the quay to the power plant is under construction (1965).

All berths are connected to the general railroad system. Lighters and tugs are available in the harbor. Two icebreakers are stationed in the port.

SUPPLIES.—Provisions, deck and engine stores of good quality are obtainable in limited quantities. Water is available at most of the berths and also delivered by water boat. Bunker coal is delivered at Hillilaituri and is always obtainable; fuel and diesel oil are available.

REPAIRS.—Repairs of a minor nature can be made to large vessels. There are several small marine railways in the harbor. A salvage tug completely equipped with diving gear is stationed here.

COMMUNICATION.—A radio station is maintained in the town. There is telegraphic communication and the railroad connects with the general system to Leningrad and other Finnish cities. Several steamship lines serve Kotka with other European and American ports.

DERATIZATION.—See section 1-7.

MEDICAL.—Two hospitals in the town will receive seamen.

HAMINA (Fredrikshamn)

Position: 60° 34' N., 27° 12' E.

Depths: Approach fairway, 5 to 16 fathoms.

Harbor fairways, 14 to 26 1/4 feet.

Anchorage, 5 to 7 1/2 fathoms

Oil Berth, 33 feet.

3C-17 The port of Hamina comprises facilities at the head and along the western side of an inlet that indents the coast about $3\frac{1}{4}$ miles. The entrance to this inlet lies about $13\frac{1}{2}$ miles northward of Haapasaari.

NAVIGATION

3C-18 See section 3C-9.

Navigation season.—From the end of April to the end of December.

DEPTHS

3C-19 A roadstead with a depth of $7\frac{3}{4}$ fathoms lies in front of the entrance of the inlet containing the port of Hamina. The entrance is interspersed with rocks and shoals through which a channel available to vessels with a draft of 24 feet leads into an outer harbor. The outer harbor extends northward, to about 1 mile from the town at the head of the inlet, with depths of 4 to 5 fathoms. Berths at Hillo on the western side of this outer harbor have depths of 23 to $27\frac{3}{4}$ feet alongside. A depth of 33 feet is at the Oil Pier. The inner harbor has depths of 2 to 3 fathoms. A channel available to vessels with drafts up to 14 feet leads through the inner harbor to the berths in the town of Hamina.

The main approach fairway which enters from seaward at Haapasaari is limited to vessels with a draft up to 24 feet; a second fairway which is entered from seaward at Orregrund is limited to a draft of $29\frac{1}{2}$ feet that may only be carried to the outer roadstead and to the oil installation pier on the southeastern point of Hillonniemi. A buoyed channel for drafts of up to 20 feet leads southward of Hillonniemi to Summa paperworks. The approach fairways are described in section 3C-7.

HARBOR

3C-20 The inlet forming the port of Hamina is entered between Hillonniemi (sec. 3C-7) and Suurniemi, about 1 mile east-southeastward. The coast has a wooded aspect similar to Kotka. In addition to the lights described in the approaches to Hamina, the building of the Finnish Cadet Corps and three churches in the town are good landmarks.

The inlet indents the coast in a northerly direction and is joined to a lake northward of the town by a narrow waterway. Lupinlahti extends about $3\frac{1}{4}$ miles southeastward

from the town and forms the peninsula Vilniemi, the southwestern part of which is Suurniemi.

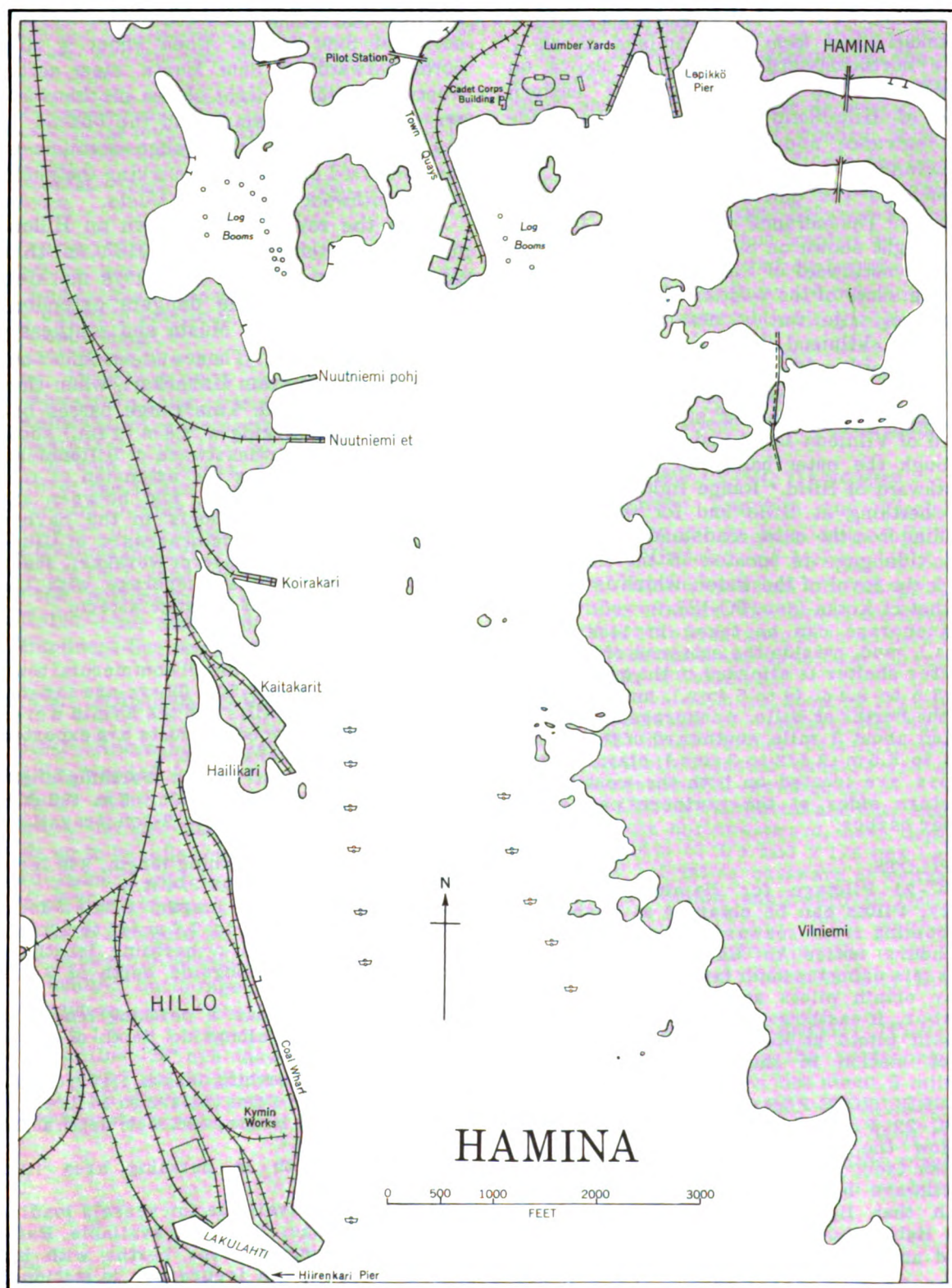
The shores of the inlet are steep-to for about 1 mile within the entrance, thence foul ground and islets extend across the inlet giving shelter to the outer harbor. Ulkokari ($60^{\circ} 32' N.$, $27^{\circ} 11' E.$), an islet, lies in the middle of the inlet about $\frac{1}{2}$ mile within the entrance. Several shoals, including a 3-fathom shoal nearly $\frac{1}{2}$ mile southwestward and a 3-fathom shoal about $\frac{1}{4}$ mile southward of Ulkokari, lie in the entrance and are marked by spar buoys on sides bordering the fairways. Norskari, a rock, lies about $\frac{1}{4}$ mile north-northeastward of Ulkokari on the western side of the channel leading into the outer harbor; spar buoys mark the eastern extremity of the foul ground in this vicinity.

The outer harbor extends about 1 mile northward of Norskari. Its eastern side is fringed by foul ground and islets extending up to $\frac{1}{4}$ mile offshore. Its western side in the southern part has berthing facilities in Lakulahti, an open basin, and alongside a wharf at Hillo, about $\frac{1}{4}$ mile northward of Lakulahti; its western side in the northern part is fringed by islets on which causeways have been extended for lighterage purposes. A 2-fathom and a 3-fathom shoal on the eastern side of the fairway through the outer harbor to Hamina are marked by spar buoys; shoals lying off the dock areas and in the approaches to Lakulahti and Hillo are also marked by spar buoys.

At the Oil Pier, located southward of Lakulahti, vessels anchor stern to the pier-head and secure to mooring buoys.

As the inner harbor at the head of the inlet is approached, the shoal dangers lie interspersed and the fairway between them is marked by spar buoys according to the uniform system (sec. 1-13). A neck of land protrudes about $\frac{1}{2}$ mile southward from the town, and the berthing facilities lie on its western side. Two large islands lie close westward of this neck and two others lie about $\frac{1}{3}$ mile eastward of it in the entrance to Lupinlahti. Booming grounds for lumber are spread between these islands and the berths.

Navigational aids.—Lights in range 016° are shown on Hillonniemi for the 24-foot approach fairway described in section 3C-7. The entrance range for this fairway is a pair of lights in range 045 $\frac{1}{2}$ ° which are shown on



Kakarkari, about 1/3 mile eastward of **Norskari**, and from the mainland about 1/4 mile northeastward. A light is shown on **Norskari**. Two beacons on the eastern side of **Hilloniemi**, about 1/2 mile inside the entrance and a third beacon on the mainland in range 325°, mark the approach to the entrance for the 29 1/2-foot fairway. The entrance range for this fairway is a light shown on **Suviluoto**, a rock about 1/2 mile northward of **Norskari**, and a beacon on the shore of the western side of **Vilniemi** about 1/4 mile farther northward in range 007 1/2°. **Vilniemi Light** is shown on the western side of **Surniemi** to mark the fairway leading eastward of **Norskari**. A pair of beacons in range 159° stand close southward of **Vilniemi Light** and mark the fairway through the outer harbor to the anchorage northward of **Hillo**. Range lights are shown for berthing at **Hillo** and for the channel leading from the outer roadstead to the town.

A tide gage is located in the harbor to mark the level of the water, which is similar to that of **Kotka** (sec. 3C-12).

Anchorage can be taken in 14 m (7 3/4 fms.), mud, outside the entrance of the inlet. Better shelter is afforded in the outer harbor in 7.5 to 9.1 m (4 to 5 fms.), mud, eastward of the berths at **Hillo**. Anchorage can also be taken about 1 mile southward of the town in 4.5 to 5.5 m (2 1/2 to 3 fms.), clay. Mooring buoys are located on both the western and eastern sides of the northern part of the outer harbor.

PILOTS

3C-21 Pilotage for **Hamina** is compulsory. Pilots can be obtained at **Haapasaari** if coming from seaward, by giving at least 6 hours notice to **Hamina** pilot station. Vessels using the inner fairways of the islands may obtain pilots at **Orregrund** or **Kotka** harbor, if eastbound. Westbound vessels can obtain pilots at **Kuorsalo** (sec. 3D-1). The pilot station in the harbor is at **Hillo**.

DIRECTIONS FOR ENTERING

3C-22 From the **Haapasaari** anchorage, follow the directions given for entering **Kotka** (sec. 3C-15) and when at the position northward of **Kuuttalpetajainen**, steer 000° with that light bearing 180° astern until the lights shown at **Hajaskari** and the mainland northward are in range 356 1/2°. Thence steer on this range, passing between the buoys marking the shoals northeastward of

Kuolioluoto and southward of the western point of **Suur Musta**. When about 1/2 mile northwestward of **Suur Musta** steer northwestward with the light shown on the western point of that island and the beacon on the southwestern point in range astern, passing westward of the buoys marking the shoal spots northwestward of **Suur Musta**.

When the range lights shown on **Hilloniemi** are intersected steer 016° on that range, passing between the buoys marking the extremities of the dangers extending northward from **Suur Musta** and southeastward from **Hajaskari**. Thence steer 045 1/2° on the range shown from **Kakarkari**, when this range is intersected. This range passes between a buoy marking a 3.6 m (2 fm.) shoal about 1/3 mile southeastward of **Hilloniemi** and a cairn marking the extension of foul ground off **Vaha Musta**, and between the buoys marking the shoals in the harbor entrance, and close southeastward of **Ulkokari**. When southeastward of **Norskari**, steer northwestward to the anchorage with the beacons on **Surniemi** in range astern.

FACILITIES

3C-23 **Hamina** is a small commercial town with a population of 9,500. There are several factories and sawmills and the **Kymin** works in **Hillo**. Various wood products are exported and coal is the chief import.

Berths.—**Hillo Coal Wharf**: berthing length 1,132 feet; depth alongside, 7 m (23 ft.). Threw 5-ton and two 6 1/2-ton travelling cranes are available.

Hilrenkari Pier: berthing length, 940 feet; depth alongside 8.4 m (27 3/4 ft.).

Lakulahti: berthing length, 5,520 feet; depths alongside, 3.6 to 7.9 m (12 to 26 ft.).

Hailikari Quay has a berthing length of 203 feet with an alongside depth of 3.9 m (13 ft.).

Nuutniemi Pier has a berthing length of 329 feet with an alongside depth of 3.6 m (12 ft.).

Town Quays: berthing length, 1,148; depths alongside 3.4 to 4.2 m (11 1/2 to 14 1/4 ft.).

Lepikko Pier: length, 490 feet; depth at the head 3 m (10 ft.).

Oil Pier: depth in berthing area 10 m (33 ft.).

Lighters are available for vessels loading at the anchorage. Tugs are available. Railroad track connects the berths with the general system. An icebreaker is stationed at **Hamina**.

Supplies.—Provisions and limited deck and engine stores are procurable. Bunker fuel and diesel oil are available at Kotka (sec. 3C-16). Water is delivered by waterboat.

Repairs of a minor nature can be effected.

Communications.—Post and telegraph offices are located in the town. The railroad is connected to the general system. Coastal passenger steamers call at the port.

Medical.—There is a hospital that will receive seamen.

ANCHORAGES

3C-24 Svartholm.—In 9.1 to 14.6 m (5 to 8 fms.), mud, about 1/3 mile eastward of the northern part of the island in the entrance of Abborfjärd.

Abborfjärd.—In 6.1 to 7.3 m (20 to 24 ft.), mud, about 1/2 mile northwestward of the northwestern point of Munapirtti.

Keihassalmi.—See section 3C-5.

Haapasaari.—In 15.5 to 22 m (8 1/2 to 12 fms.), mud and stones, about 1/2 mile eastward of the island and in 24 to 26 m (13 to 14 1/4 fms.), mud and stones, about 1/2 mile northward of the island.

Kirkkomaansaari.—In 12.8 to 14.9 m (7 to 8 1/4 fm.), sand and mud, close northward of the northeastern point of the island.

Kotka.—See section 3C-14.

Hamina.—See section 3C-20.

Part D. HAMINA TO VYBORGSKIY ZALIV

3D-1 Kuorsalo (60°28' N., 27°24' E.) is a hilly, wooded island lying about 1/2 mile offshore about 7 miles southeastward of Hamina harbor entrance. Foul ground extends up to 2/3 mile southeastward and southward from it and lies between it and the islet of Houterinsaari, about 2/3 mile southwestward. Dangers lie up to 2 1/2 miles offshore between Kuorsalo and Hamina. There is a loading anchorage in an inlet on the northeastern side of the island in depths of 5.8 to 9.1 m (3 1/4 to 5 fms.), mud. Range lights in line 026° are shown near the center of the island and on Houterinsaari. A pilot station with a signal mast is maintained on the southeastern point of the island.

COAST—GENERAL

3D-2 Between the entrances of the port of Hamina and Vyborgskiy Zaliv, about 80 miles eastward, the coast is rocky, hilly, and for the greater part wooded. It is indented by several bays and fjords, the largest of which, Virolahti, is entered midway along this stretch of the coast. Between Kuorsalo and Virolahti the coast is fronted by numerous islets and dangers, but eastward of Virolahti the off-lying features are not as numerous. There are several loading places and anchorages on this coast but none of commercial importance. There is an inner fairway for 24-foot drafts that leads about 3 1/2 miles offshore between the off-lying dangers.

DEPTHS—OFF-LYING DANGERS

3D-3 Between Kuorsalo and Virolahti the dangers lie up to 12 1/2 miles offshore and between Virolahti and Vyborgskiy Zaliv there are detached patches of foul ground up to 7 miles offshore. The depths are irregular and from 37 to 51 m (20 to 28 fms.) between some of the dangers and up to 70 m (38 fms.) in the vicinity of Sommars.

The islands of Sommars, about 12 1/2 miles east-southeastward of Veitkari, and Narvi, about 9 1/2 miles farther east-northeastward, and their adjacent dangers are described in sections 2C-4 and 2C-6.

Pitkanen (Banka Pitkkanen) and City Rock, about 1/4 mile northwestward, have depths of 6.7 and 4.6 m (3 3/4 and 2 1/2 fms.) and lie about 15 1/2 miles eastward of Veitkari and about 9 1/2 miles southward of Ostrov Pukkion-Sari (sec. 3D-6). The southern extent of the dangers fronting the coast lie between Veitkari and Pitkanen. City Rock is marked by a spar buoy.

Ostrov Vidskyaren (Kiuskeri) (Fiskar) (60°24' N., 27°57' E.), the easternmost of a small group of islets, lies about 5 miles southeastward of Ostrov Pukkion-Sari and 10 miles northward of Narvi. It is the pilot station for the various loading places of the adjacent coast. The group of islets

extends about $\frac{3}{4}$ mile southwestward from Ostrov Vidskyaren and is surrounded by foul ground to a distance about $\frac{1}{3}$ mile off. Rocks and patches of foul ground with depths of 3.9 to 6.4 m (2 $\frac{1}{4}$ to 3 $\frac{1}{2}$ fms.) lie within 1 $\frac{1}{4}$ miles southward of these islets. Spar buoys are moored on the extremities of the foul ground surrounding the islets and those southward of them. A lifesaving station and a signal station are located on the islets.

Ostrovgalli (Halli) (Khalli) is a steep-to rock about 5 $\frac{1}{2}$ miles eastward of Ostrov Vidskyaren and about 6 $\frac{1}{2}$ miles offshore. A light is shown on the rock.

Shoals, with depths of 3.0 to 9.1 m (1 $\frac{3}{4}$ to 5 fms.), lie within 1 mile south-southeastward through about 2 $\frac{3}{4}$ miles southwestward of the rock. A 7.3 m (4 fm.) shoal lies about 4 miles southward of the rock, and a 9.1 m (5 fm.) shoal lies about $\frac{1}{2}$ mile northwestward of the rock.

Tatasova, a 6.4 m (3 $\frac{1}{2}$ fm.) patch, lies about 2 $\frac{1}{4}$ miles northward of Ostrov Galli.

Ruis Matala, a shoal area with depths of 1.0 to 1.5 m (3 to 5 ft.), lies about 2 $\frac{1}{2}$ miles eastward of Ostrov Galli. A spar buoy is moored about $\frac{1}{2}$ mile northward of the 1.5 m (5 ft.) spot.

A dangerous wreck lies about 1 $\frac{1}{2}$ miles eastward of Ostrov Galli.

NAVIGATION

3D-4 From the position about 1 mile northward of Ostrov Sur-Sari (sec. 2C-4), a course of 072° for about 23 $\frac{1}{4}$ miles leads to a position about 3 miles northeastward of Sommars. Thence a course of 049° for about 15 $\frac{1}{4}$ miles leads to a position about 1 mile northwestward of Ostrov Galli. From the latter position, a course of 073° for about 6 $\frac{1}{4}$ miles leads to a position about $\frac{3}{4}$ mile west-southwestward of Ostrov Ruonti (sec. 3E-3). The latter course is marked by range lights on Ostrov Ruonti and on Mys Alvatinniyemi (sec. 3F-1) and leads close southward of a 3.6 m (2 fm.) patch, marked by a light buoy, about 2 miles westward of Ostrov Ruonti. Thence a course of 044° for about 1 mile leads to a position northward of Ostrov Ruonti where the pilot can be obtained. These courses pass over a least depth of 10.9 m (6 fms.).

COASTAL FEATURES

3D-5 Tammio (60°25' N., 27°25' E.) lies about 2 miles southward of the southeastern point of Kuorsalo and extends about 1 mile southward. It is the largest of a group of barren islets and rocks. Two of the largest islets lie about $\frac{1}{2}$ mile westward and southward of Tammio. Foul ground surrounds this group up to $\frac{1}{3}$ mile off and also lies in patches within 1 $\frac{1}{4}$ miles northward and 1 $\frac{1}{2}$ miles northwestward and westward; it is marked on the fairway sides with spar buoys. A pair of lights in range 070° is shown from Tammio and the southern end of the islet westward of it. This range marks the stretch of the 29 $\frac{1}{2}$ -foot fairway approaching the dangers extending southeastward from the approach of Hamina.

Submarine cables (sec. 1-34) are laid between the loading place on Kuorsalo and the mainland immediately northeastward. Another cable is laid between that position on the mainland and the island of Tammio.

The Vasikkasaari group lies about 1 mile northeastward of Tammio. Foul ground extends 4 $\frac{1}{2}$ miles south-southeastward to the dangers extending eastward from Haapasaari and about 1 $\frac{1}{4}$ miles northwestward to within $\frac{1}{3}$ mile eastward of the shoals extending southeastward from Kuorsalo. A light is shown from Lotouri, a rock lying midway on the foul ground extending northwestward. The fairway for 24-foot drafts passes close northward of this light and between the spar buoys marking the dangers extending southward from Kuorsalo and northward from Tammio and the Vasikkasaari group.

Mustamaa, an island, lies about 2 miles eastward of the Vasikkasaari group. It is steep-to on the western side. Foul ground

extends about $\frac{3}{8}$ mile southeastward from the island. An above-water rock, with a spar buoy moored close northward, lies about $\frac{1}{4}$ miles westward of the northwestern point of the island. A cairn is located on the northwestern point and a pair of beacons in range stands close northeastward and marks the approach to a 15-foot fairway marked by buoys that leads through the foul ground lying between Mustamaa and Ruissaari, an island about $\frac{1}{2}$ mile north-northwestward. A light is shown on the southwestern point of Mustamaa. The fairway between the off-lying islands eastward of Mustamaa is limited to 20-foot drafts.

Kalvijärvenlahti, a large bay indenting the coast in a northwesterly direction, lies about 1 mile northward of Mustamaa. It is formed by the mainland on the western and northern sides and Siikasaari, an island connected to the mainland by an isthmus, on the eastern side. Islets and foul ground lie between the eastern and western sides and Mustamaa, on the southern side. The inlet is entered close westward of Ruissaari and has general depths of 11.9 to 18.3 m (6 $\frac{1}{2}$ to 10 fms.). The northeastern side of the bay is fronted by islets and foul ground up to $\frac{2}{3}$ mile off and several shoal patches, marked by spar buoys on the fairway sides, lie in the bay. Havouri, a rock with foul ground extending about $\frac{1}{4}$ mile northeastward and southeastward from it, lies about 1 $\frac{1}{2}$ miles north-northwestward of Ruissaari. Anchorage can be taken in 11.9 to 14.6 m (6 $\frac{1}{2}$ to 8 fms.) sand, about $\frac{1}{2}$ mile northwestward of Havouri and at the head of the bay within the islets fronting it in 6.4 to 7.3 m (3 $\frac{1}{2}$ to 4 fms.), mud.

Pilots are obtained at Haapasaari by giving at least 6 hours notice to Hamina, and Kuorsalo. Fairways for 24-foot drafts and 18-foot drafts lead to the anchorages. Vessels load at the anchorages and must clear at the customs station at Haapasaari if bound for foreign ports.

Maringinlahti, a bay, lies on the northeastern side of Siikasaari and is entered close eastward of the southeastern point of the island. There are general depths of 4.9 to 10.9 m (2 $\frac{3}{4}$ to 6 fms.). Anchorage can be taken in the northern part in 7.3 to 8.2 m (4 to 4 $\frac{1}{2}$ fms.), stone and sand. Lights are shown on Lipra, an islet in the entrance, and on the southeastern point of Siikasaari; these lights in range 033 $\frac{1}{2}^{\circ}$ mark the fairway between the dangers extending southeastward from Kalvijärvenlahti and Mustamaa. Range beacons are located on the northern shore of the inlet and mark the fairway through the entrance. The fairway from Mustamaa is available for 20-foot drafts and into the inlet for 18-foot drafts. This landing place is under the jurisdiction of the customs station at Haapasaari.

Parrio and Santio (60°28' N., 27°43' E.) are adjacent islands, their western and northwestern sides are steep-to, and dangers lie up to $\frac{1}{4}$ mile offshore elsewhere; a spar buoy marks its southern extent. A light is shown on the southwestern side of Parrio. Beacons on the eastern side of Parrio and the southern point of Santio in range mark a fairway from seaward for 15-foot drafts between the dangers extending westward from Ostrov Pukkion-Sari (sec. 3D-6).

Ostrov Kinnarit, about 1 $\frac{1}{2}$ miles south-

ward of Parrio, lies on a bank of foul ground with several islets that extends about 1 mile northwestward and southeastward from it. Detached patches, with depths of 4.5 to 7.3 m (2 1/2 to 4 fms.) lie 2/3 mile farther northwestward and 1 1/4 miles southeastward. A pair of lights in range 263 1/2° is shown from this islet and on another close eastward to mark the fairway for 20-foot drafts from eastward.

Huovari lies about 2 miles southward of Ostrov Kinnarit on the southern end of a bank with depths less than 9.1 m (5 fms.). This bank with several rocks and an islet on the northern end is nearly 1 mile in extent. A rock, with a depth of 0.3 m (1 ft.), lies about 2/3 mile eastward and another rock with a depth of 5.5 m (3 fms.) lies about 3/4 mile westward of the island. A fishing light is shown from the island.

A seal rookery has been established southward of Huovari. (See section 2C-6.)

Territorial boundary.—The territorial boundary between Finland and U.S.S.R. is delineated by special marker buoys. This boundary lies on the eastern side of Virolahti, passes through the middle of the entrance to the inlet and thence about 1 mile southeastward of the western entrance point. Thence it passes about 1/2 mile eastward and southeastward of Santio, close westward of Ostrov Kinnarit, about 2/3 mile eastward of Huovari, and thence southwestward to within 5 miles northwestward of Sommars.

See caution in section 1-32.

DANGERS IN APPROACH TO KAVONSELKÄ

3D-6 Ul'ko-Matala and Okhta-Matala (Banka Otamatala), with a depth of 0.9 and 2.7 m (3 and 9 ft.), lie about 1 and 3 1/4 miles respectively southward of Hemminginletto. Sisa-Matala with a depth of 6.1 m (3 1/4 fms.) lies about 3/4 mile southwestward of the rock. These rocky patches lie on the eastern side of the approach and are

marked with buoys according to the uniform system.

Hemminginletto (60°27' N., 27°50' E.) is a rock about 1 1/4 miles eastward of Ostrov Pukkion-Sari. It is the eastern entrance point of Kavonselkä and is the southernmost danger of those extending about 1 3/4 miles southward from Ostrov Patio. A light is shown on the rock and a spar buoy marks the western limits of the dangers lying between it and Ostrov Patio. A shoal with a depth of 7.0 m (3 3/4 fms.) lies about 1/4 mile westward of the rock.

Ostrov Pukkion-Sari (Ostrov Pukkio) is an island on the southern end of the foul ground extending about 3 miles southeastward from the western entrance point of Virolahti and forming the southern side of Kavonselkä. A light is shown on the southern end of the island. A 5.5 m (3 fms.) shoal marked by a buoy lies 1/4 mile southeastward and rocky patches with depths of 1.2 m and 2.7 m (4 ft. and 1 1/2 fms.) lie about 1/4 and 1 mile southwestward of the lighthouse and a 0.6 m (2 ft.) shoal lies 1 1/4 mile westward of the light; spar buoys are moored on these patches. Foul ground, marked according to the uniform system by spar buoys, lies in patches up to 1 1/2 miles southwestward of the western side of the island. A fairway for 11-foot drafts leads through the foul ground that lies between the western entrance point of Virolahti and the islands northwestward of Ostrov Pukkion-Sari; it is marked with spar buoys.

KAVONSELKA AND VIROLAHTI

3D-7 Kavonselkä, entered between Hemminginletto and Ostrov Pukkion-Sari, extends about 3 3/4 miles north-northwestward and has general depths of 7.3 to 27 m (4 to 14 fms.). Safe anchorage is afforded about 1 1/2 miles within the entrance. The inlet is about 3/4 mile wide. Spar buoys mark the edges of the foul ground on either side and the shoals

in the northern part. A fairway for 24-foot drafts leads through the inlet to the entrance of Virolahti, and to the loading place close westward of the entrance. There is a depth of 20 to 24 feet at the loading place.

Virolahti (Zaliv Viro-Lakhti) is entered at the northern part of Kavonselkä between Ostrov Patio, to eastward, and a point of the mainland, to westward, and extends about $5\frac{1}{2}$ miles northward. It is the western part of an extensive inlet divided by three large islands, of which Ostrov Patio is the southernmost. There are general depths of 4.5 to 9.1 m (2 $\frac{1}{2}$ to 5 fms.) and the inlet gradually shoals its head with dangers lying interspersed between the fairways and the shores.

The entrance is encumbered by several islets through which a fairway for 11-foot drafts leads to a loading anchorage, with a depth of 13 to 17 feet, about 3 $\frac{1}{2}$ miles northward of the islets. A fairway for 10-foot drafts leads to another loading anchorage about 1 $\frac{1}{4}$ miles farther northward. These fairways are marked by spar buoys according to the uniform system.

Pitkapaasi, an island group on an extensive area of foul ground, fronts the entrance of the eastern inlet. Ostrov Pitkyapasi, the largest and western of the group, lies about $\frac{1}{2}$ mile southeastward of the southern end of Ostrov Patio. This group lies within 1 $\frac{3}{4}$ miles northeastward and east-northeastward of Ostrov Pitkyapasi, and detached patches with depths of less than 3.6 m (2 fms.) lie within 1 $\frac{1}{2}$ miles east-southeastward and $1\frac{1}{4}$ miles southeastward of that island. Spar buoys are moored at the outer ends of the foul ground and patches. A light is shown on Ryöholma, the northeasternmost islet.

Pitka-Pas is sheltered by Ostrov Patio on the western side, by the Pitkäpaasi group on the southern side, and by the foul ground extending offshore on the eastern side. This roadstead lies in the entrance to the eastern

part of the afore-mentioned inlet and affords safe anchorage. A fairway for 20-foot drafts enters eastward of the Pitkäpaasi group. A fairway for 12-foot drafts enters the southwestern part of the road between Ostrov Patio and Ostrov Pitkyapasi.

A fairway for $16\frac{1}{2}$ -foot drafts enters the eastern part of the road and leads to loading anchorages near the head of the inlet. A pair of beacons in range at the head of the inlet and on an islet about $\frac{1}{2}$ mile southward marks the fairway. A pair of range beacons at the eastern entrance point marks a fairway for 20-foot drafts to a loading anchorage, with a depth of 8.2 m (27 ft.), in the northern part of Pitka-Pas.

Pilots for the loading places in this area are obtained at Ostrov Vidskyaren (sec. 3D-3). A lifesaving station is located on Ostrov Pitkyapasi.

COASTAL FEATURES (Continued)

3D-8 Between Ostrov Patio and Mys Kryuserort, about $11\frac{3}{4}$ miles east-northeastward, three small peninsulas project about $1\frac{1}{2}$ miles south-southeastward and are equidistant from Mys Kryuserort. The westernmost peninsula is about $4\frac{1}{2}$ miles east-northeastward of Ostrov Patio. Foul ground extends up to $2\frac{1}{4}$ miles offshore and patches of foul ground are found an additional 2 miles farther seaward; the coastal dangers as well as the fairway sides of the detached patches are marked with spar buoys.

Zalivi Urpalan-Lakhti, Satama-Lakhti, Kaukealan-Lakhti, in that order from westward, are three bays formed by the three latter peninsulas and Mys Kryuserort. Foul ground extends from $\frac{3}{4}$ mile southward to $1\frac{1}{4}$ miles southeastward from the point and spar buoys are moored at the southern edges. There are general depths of 7.3 to 18.3 m (4 to 10 fms.) in the bays and safe anchorage is afforded. An islet lies in Zaliv Urpalan-

Lakhti about 1/2 mile westward of the eastern entrance point and in Zaliv Satama-Lakhti close eastward of the latter point.

Malyy Fiskar (Pien Kalastaja) (60°29'N., 28°08'E.) is an islet about 1 1/2 miles southward of the entrance of Zaliv Satma-Lakhti. A light is shown from the islet. Foul ground extends about 1/4 mile southward and south-westward from the islet and a spar buoy is moored at its edge. A spar buoy is moored on a 9.1 m (5 fm.) about 1/2 mile northward of the islet; a 5.8 m (3 1/4 fm.) shoal lies close northward.

Ostrov Oris-Sari lies about 1/4 mile off the western entrance point of Zaliv Kaukealan-Lakhti on the foul ground extending south-eastward from it. A light is shown on the islet. A pair of range beacons stands on the shore at the head of the bay and marks the fairway for 20-foot drafts into the bay. Spar buoys mark the adjacent shoals. A light buoy is moored on the northern end and a spar buoy is moored on the southern end of a 7.3 m (4 fm.) shoal with a 1.5 m (5 ft.) head located about 1 1/4 miles southeastward of Ostrov Oris-Sari. Patches of foul ground with depths of 1.2 to 5.5 m (4 ft. to 3 fms.) lie about 1 1/2 miles south-southeastward of the islet and extend about 3 miles southeastward; spar buoys are moored on their extremities.

ANCHORAGES

3D-9 Kuorsalo.—In 12.8 m (7 fms.), mud, about 3/4 mile northwestward of the island, for vessels of 14-foot drafts. See section 3D-1.

Kalvijarvenlahti.—See section 3D-5.

Maringinlahti.—See section 3D-5.

Kavonselka.—In 14.6 to 18.3 m (8 to 10 fms.), sand and mud, about 1 1/2 miles within the entrance. There is shelter from all but southerly and southeasterly winds.

Pitka-Pas.—In 11.9 m (6 1/2 fms.), mud, about 1 mile west-southwestward of Ryo-holma.

Zaliv Urpalan-Lakhti.—In 10.9 m (6 fms.), sand, close northward of the islet in the eastern part.

Zaliv Satama-Lakhti.—In 13.1 m (7 1/4 fms.), sand and stones, northward of the islet in the western part.

Zaliv Kaukealan-Lakhti.—In 10.9 m (6 fms.), sand and mud, on the range about 1/2 mile from the head of the bay.

Part E. VYBORGSKIY ZALIV

3E-1 Mys Kryuserot (Mys Ristniyeti) (Ristiniemi) (Mys Krestovyy) (60°31' N., 28°14' E.), the western entrance point of Vyborgskiy Zaliv, extends about 2 miles southeastward from the mainland. Foul ground extends about 1 mile eastward and southeastward from the point; spar buoys are moored at the extremities.

Mys Kryuserort Light is shown from a structure on a rocky mass about 1 1/2 miles southeastward of the point. A spar buoy is moored close northward. A 4.5 m (2 1/2 fm.) shoal marked by spar buoys, lies about 1/2 mile northwestward and northeastward of the light. Foul ground lies within 1 1/2 miles east-southeastward through 2 miles south-southeastward of the latter shoal. Spar buoys mark its southern side.

COAST—GENERAL

3E-2 Vyborgskiy Zaliv extends about 19 miles northeastward from Mys Kryuserort to the port of Vyborg at its head. It is entered between Mys Kryuserort and Mys Alvatinn-iyemi, about 6 3/4 miles southeastward. The shores of the gulf and its islands are rocky and covered with pine forests. It is subdivided into several parts by inlets, peninsulas, and islands. Numerous shoals and dangers lie in its approach and are scattered throughout the gulf.

DEPTHS—DANGERS IN APPROACH

3E-3 The depths within the entrance of

the gulf are less than 31 m (17 fms.) and less than 18.3 m (10 fms.) at Reyd Uuras and north-eastward to Vyborg. Fairways for 30-foot drafts leads to Reyd Uuras, 25-foot drafts to Gavan' Uuras, and 20-foot drafts to Vyborg.

Ostrov Ruontti (Rondo) (60°27'N., 28°21'E.) lies about 5 miles southeastward of Mys Kryuserort and about 2 1/2 miles west-southwestward of Mys Alvatinniyemi. A light is shown on the northern end of the island. Shoals extend about 1/4 mile from the northern, western, and southern parts of the island. Several dangers with a least depth of 0.9 m (3 ft.), lie within 4 miles south-southwestward of the island.

A shoal, with a depth of 3.6 m (2 fms.) and with a light buoy moored on its southern side, lies about 2 miles westward of Ostrov Ruontti. Another shoal, with a depth of 5.8 m (3 1/4 fms.) and marked with a middle ground buoy, lies about 2 1/4 miles north-northeastward of the island.

The dangers extending from Mys Kryuserort and northward from Mys Alvatinniyemi are described in sections 3E-1 and 3F-1.

A 5.5 m (3 fm.) shoal, marked on its western side by a spar buoy, lies about 3 miles south-southwestward of Ostrov Kuninkan-Sari (sec. 3E-5). The northern end of an area of foul ground, with depths of less than 6.4 m (3 1/2 fms.) and two underwater rocks, lies about 3/4 mile westward of the shoal and extends about 3/4 mile southeastward. A light buoy with a radar reflector is moored on its northern end and a spar buoy is moored on its southern end. Patches of foul ground lie about 1 mile southeastward of the 5.5 m (3 fm.) shoal and extend about 1 1/2 miles south-southeastward and about 3/4 mile offshore. Spar buoys are moored on their western sides. Two patches, with a least depth of 7.6 m (4 1/4 fms.), lie within 1 mile southeastward of the latter foul ground. An unmarked 7.9 m (26 ft.) shoal lies on the western side of the fairway about 2 3/4 miles southwestward of Ostrov Kuninkan-Sari. A dangerous wreck lies about 4 1/4 miles south-southwestward of Ostrov Kuninkan-Sari.

Three shoals, with a least depth of 6.4 m (3 1/2 fms.), lie about 1 2/3 miles northeastward of Mys Kryuserort Light. A spar buoy is moored on the middle shoal.

NAVIGATION

3E-4 From Ostrov Sur-Sari see section 3D-4.

From Leningrad Guba see section 3F-4.

COASTAL FEATURES

3E-5 Bukhta Vilalakhti indents the northwestern shore of the gulf about 2 1/4 miles in a northwesterly direction about 6 1/4 miles northeastward of Mys Kryuserort. Dangers lie up to 1 3/4 miles offshore between Mys Kryuserort and the inlet and are marked with spar buoys at their extremity. There are general depths of 10.9 to 21.0 m (6 to 11 1/2 fms.) to within 1 mile of the head of the inlet where the Vilayoki empties. A fairway for 24-foot drafts leads to a loading anchorage in 10.9 m (6 fms.), mud, about 1 mile from the head of the inlet. A 5.5 m (3 fm.) shoal marked by a spar buoy lies on the northern side of the fairway about 1 1/4 mile southward of the northern entrance point of the inlet. The town of Vilayoki lies on the northern side of the river entrance. A quay, with a depth of 5.2 m (17 ft.) alongside, lies at the eastern end of the town.

Ostrov Teykar-Sari (Igrivyy) (60°35'N., 28°28'E.) lies about 1 1/4 miles eastward of the northern entrance point of Bukhta Vilalakhti and extends about 1 1/4 miles southeastward. A lighted buoy is moored on the edge of foul ground extending about 1/4 mile south-eastward from the island. The island is the outermost of several lying on foul ground extending about 3 miles southeastward from Bukhta Vilalakhti and thence about 4 1/4 miles north-northwestward toward the northern

shore. A loading anchorage in 10.9 m (6 fms.), mud, is located close off this foul ground about 2 miles northward of Ostrov Teykar-Sari. A fairway for 24-foot drafts leads to the anchorage. A 6.4 m (3 1/2 fm.) shoal, marked by a spar buoy, lies on the southern side of this fairway about 2 miles north-northeastward of the southern point of the island.

Foul ground with a few islands extends about 2 1/2 miles southeastward and southward from the northern shore and terminates about 2 1/4 miles north-northeastward of the southern point of Ostrov Teykar-Sari. Koivusaari, a loading anchorage, with a depth of 8.2 m (4 1/2 fms.), sand and mud, lies about 4 miles northward of the southern end of Ostrov Teykar-Sari and close northwestward of Ostrov Suonionsaari (Krepys), located about 2 1/2 miles northeastward of the latter island. Spar buoys mark the eastern side of the foul ground and the edges of the anchorage. A fairway for 24-foot drafts lies between these buoys and Ostrov Suonionsaari. The village of Repola lies on the mainland about 1 mile northeastward of the anchorage. There is a wharf about 500 feet long and with a depth of 1.5 m (5 ft.) alongside. A large sawmill uphill from the wharf is a useful landmark.

Ostrov Kuninkan-Sari (Mayachnyy) lies about 1 1/4 miles north-northwestward of the end of a peninsula extending about 10 miles northwestward from the southeastern shore of the gulf. Foul ground lies between the island and the northern end of the peninsula and also within 3/4 mile eastward of the island. A light is shown on the northern end of the island and spar buoys are moored on the edges of the foul ground. A beacon stands on a rock close northwestward of an island close southward of Ostrov Kuminkan-Sari; a light is shown on the southeastern end of that island. Except for the foul ground described in section 3E-3, the shores of the peninsula are rather clear of dangers. A 8.2 m (4 1/2 fm.) shoal lies about 1/2 mile northeastward of Ostrov Kuninkan-Sari and a 8.5 m (4 3/4 fm.) shoal lies about 3/4 mile southeastward of Ostrov Teykar-Sari. Middle

ground buoys are moored on these shoals. A spar buoy marks a 1.2 m (4 ft.) shoal which lies about 1 1/2 miles eastward of the southern end of Ostrov Teykar-Sari.

An extensive inlet lies on the northeastern side of the above mentioned peninsula and is entered between the northern end of the peninsula and the southern end of Ostrov Uuransaari, about 3 1/4 miles east-northeastward. The greater part of the eastern side of the inlet is foul and occupied by islands, but between Ostrov Revonsari (Lisiy) (Ostrov Rivansari), which lies with its northwestern end about 3 miles southeastward of the northern end of the peninsula, and the peninsula there are general depths of 10.9 to 25 m (6 to 13 1/2 fms.). Ostrov Revonsari lies parallel to the peninsula about 1 mile off and is 5 miles long. The town of Rempeti (Villi) (60°25'N., 28°43'E.) stands on the mainland close southeastward of the southeastern extremity of Ostrov Revonsari, and Maksikhden Satma, a loading anchorage, lies between the island and the town.

Several shoals, marked on their fairway sides with spar buoys, lie interspersed in the inlet between the island and the peninsula. A fairway for 24-foot drafts leads to the loading anchorage and piers at Rempeti; it is marked by range beacons located on the peninsula, on Ostrov Revonsari, and on an island close southward of the southeastern extremity of Ostrov Revonsari. Nine piers, with depths of 2.4 to 3.0 m (8 to 10 ft.) alongside, project from Rempeti. Tugs and lighters are available. The piers have railroad connection.

Loading anchorage.—There is a loading anchorage, with depths of 6.4 to 13.7 m (3 1/2 to 7 1/2 fms.), mud, close offshore about 6 miles north-northwestward of Rempeti. It lies between a narrow projecting peninsula and the islands extending south-southeastward from Ostrov Uuransaari (Vysotskiy). A fairway for 20-foot drafts leads from Rempeti to the anchorage; it is well marked with spar buoys and range beacons.

There are several piers, with railroad connection, on the peninsula. A large smoke-

stack at the root of the peninsula serves as a good landmark in approaching the anchorage.

REYD UURAS lies between Ostrov Teykar-Sari and Ostrov Uuransaari, nearly 2 1/2 miles eastward, and Ostrov Suonionsaari, close northwestward of the latter island. There are general depths of 10.9 to 16.4 m (6 to 9 fms.) in this roadstead.

DANGERS IN REYD UURAS.—**HALLI** (Khali), a foul bank marked with buoys, lies about 3/4 mile westward of the entrance of Gavan' Uuras about 2 miles northeastward of the southern end of Ostrov Teykar-Sari. The light on the northern part of this bank in range 043° with the light on Karniemi (Ostryy), the southwestern point of Ostrov Suonionsaari indicate the approach to Gavan' Uuras.

Several 6.4 to 8.2 m (3 1/2 to 4 1/2 fm.) shoals, marked with spar buoys, lie in the roads. An unmarked 7.6 m (4 1/4 fm.) shoal lies near the fairway about 1/2 mile southwestward of Halli Light.

LOADING PLACES.—Fairways for 24-foot drafts lead from Reyd Uuras to a loading place close northwestward of the northern end of Ostrov Suonionsaari and another about 2 miles west-southwestward.

GAVAN' UURAS

Position: 60° 37' N., 28° 34' E.

Depths: Approach channel to anchorage (Reyd Uuras), maximum draft 30 feet.

Channel, anchorage to Gavan' Uuras maximum draft 24 feet.

New Harbor, 25 feet.

Inner Harbor, 24 to 36 feet.

3E-6 GAVAN UURAS (Vysotsk), the outport of Vyborg, lies between Ostrov Uuransaari and Ostrova Suonionsaari, Esisaari,

and Ravansaari; the latter two islands lie between the western side of Ostrov Suonionsaari and the northern side of Ostrov Uuransaari. The town of Uras stands on the northern part of the latter island and on Ostrov Ravansaari.

NAVIGATION.—See section 3D-4.

NAVIGATION SEASON.—Over a number of years of observation the earliest date on which navigation was closed by ice was December 8 and the latest February 28. The earliest date on which navigation was opened was April 4 and the latest May 19. Ice breakers are available to keep the channel open when necessary.

DEPTHS.—The approach to Gavan Uuras is through Reyd Uuras. The depths to Reyd Uuras are available for 30-foot drafts and from there to the harbor the maximum draft allowed is 24 feet. New Harbor has a depth of 7.6 m (25 ft.) and Inner Harbor has depths of 7.3 to 10.9 m (24 to 36 ft.).

HARBOR.—The harbor entrance lies about 3/4 mile eastward of Halli and has two breakwaters projecting toward each other. Lights are shown on the breakwater heads. There are several dolphins on the western and eastern sides of the harbor. The channel and dangers in the harbor are well buoyed. Lights are shown from various places in the harbor. **STORM SIGNALS** (sec. 1-16) are displayed.

ANCHORAGE may be taken in Reyd Uuras. The best anchorage is in 14.6 m (8 fms.), mud, about 1 1/2 miles westward of the entrance to Gavan' Uuras.

Pilotage is compulsory. See section 3E-13.

DIRECTIONS FOR ENTERING.—From westward: after leaving Ostrov Ruonti steer northward, passing about 1/2 mile westward of the wreck lying about 4 1/2 miles south-southwestward of Ostrov Kuninkan-Sari and about the same distance westward of the light buoy moored about 3 1/4 miles southwestward of the same point.

Thence steer north-northeastward to pass about 1/2 mile westward of Ostrov Kuninkan-Sari and then steer east-northeastward to pass about 1/4 mile northward of that island and on either side of the middle ground buoy marking the shoal about 1/2 mile north-eastward. Thence pass southward of the spar buoy marking the extremity of the foul ground extending from Ostrov Teykar-Sari and steer northeastward into Reyd Uuras. This fairway is available for 30-foot drafts.

3E-7 URAS (Trangsund) is under the customs jurisdiction of Vyborg. The town is situated on the islands of Ostrov Vuransaari and Ostrov Ravansari. It is the loading port for Vyborg. The towns are connected by railroad and there is telephone and telegraph communication between them. Passenger ferries run between the harbors.

Vessels load at moorings.

Storm signals are shown at Gavan' Uuras.

Reports indicate that the piers and port facilities are in a state of disrepair and that many are no longer existent. Some new construction has been reported in the port area (1964).

VYBORG (Viipuri)

Position: 60°43' N., 28°45' E.

Depths: Approach fairway, 3 1/2 to 10 fathoms.

South Harbor berths, 10 to 23 feet.

North Harbor berths, 8 to 11 1/2 feet.

Port plan: See section 3E-15.

3E-8 The port of Vyborg is located at the head of Vyborgskiy Zaliv about 6 miles north-eastward of Uras. It is the terminus of the Saymenskiy Kanal which connects Saimaajarvi, in Finland, with the gulf.

NAVIGATION SEASON

3E-9 Similar to Gavan' Uuras, see section 3E-6.

DEPTHS

3E-10 A 20-foot channel, about 12 miles long, leads from Gavan Uuras to Vyborg. There are depths of 3 to 7 m (10 to 23 ft.) at the berths in South Harbor and 2.4 to 4.5 m (8 to 11 1/2 ft.) at the berths in North Harbor.

HARBOR APPROACHES

3E-11 The channel between Gavan' Uuras and Vyborg is marked by SPAR BUOYS, BEACONS, AND LIGHTS. The southwestern part of this channel is relatively clear of dangers, but the northeastern part, within 2 1/2 miles of Vyborg, becomes intricate and leads between several islets and numerous dangers.

HARBOR

3E-12 South Harbor, into which leads the 20-foot channel, is separated from North Harbor by a bridge, of which the southeastern section can be swung open to allow vessels with a 24-foot beam to pass. There are two swing bridges in the northeastern part of North Harbor that provides access to Saymenskiy Kanal; North Harbor is used only by small vessels navigating along the canal to Saimaa and to the lakes and inland waterways.

Both harbors are lined with quays.

PILOTAGE

3E-13 Pilotage is compulsory in the Gulf of Vyborg. Pilots board inward bound vessels in the vicinity of 60°34' N., 28°23' E.

3E-14 This section has been deleted.

3E-15 Vyborg lies on either side of North and South Harbors at the head of Vyborgskiy Zaliv. The castle with its massive towers, located on the island between North and South Harbors, is the most prominent building in the city. Timber and wood products are the principal exports. There is a customs station here.

Berths.—South Harbor, although small, has about 6,630 feet of quayage with depths alongside of 10 to 23 feet. The main quay is about 2,600 feet long. There are five 5-ton and four 3-ton traveling cranes; two $2\frac{1}{2}$ -ton locomotive cranes and one 18-ton fixed rotary crane. There is a $2\frac{1}{2}$ -ton floating crane. A grain elevator with a reported capacity of 50 tons per hour is located in the South Harbor area.

North Harbor has about 7,785 feet of quayage with a depth of 10 feet alongside.

Most of the quays in both harbors are connected to the general railroad system.

Tugs are available at Uras.

Supplies.—Fresh provisions and coal are available. Water is laid onto the piers.

Repairs.—Small repairs can be effected. There is a marine railway with a lifting power of 500 tons, an extreme length of 140 feet, a cradle length of 134 feet, and draft forward of 8 feet and aft of 12 feet. A floating drydock with a lifting capacity of 3,000 tons is available.

Communications.—Vyborg is a station on the Helsinki-Leningrad railroad. A radio station is located in the town. There is telegraph service with other European and United States cities and telephone communication with nearby cities of U.S.S.R. and Finland. An airfield is located near the city.

Deratization.—See section 1-7.

Medical.—Hospital facilities are available.

ANCHORAGES

3E-16 Bukhta Vilalakhti.—See section 3E-5.

Rempeti.—In $3\frac{3}{4}$ to $4\frac{1}{2}$ fathoms, clay and sand, between the island close southward of Ostrov Revonsari and Rempeti.

Gavan' Uuras.—See section 3E-6.

Part F. VYBORGSKIY ZALIV TO MYS STYURSUD

3F-1 Mys Alvatinniyemi (Alvatinniemi) ($60^{\circ}28' N.$, $28^{\circ}26' E.$) is the low wooded northern point of Ostrov Piy-sari and lies about 2 miles westward of the coast. A light is shown on the point.

Shoal patches, with depths less than 5 fathoms and a $1\frac{1}{2}$ -fathom patch at the middle, extend about $\frac{3}{4}$ mile northwestward from the point. A light buoy is moored at the extremity.

COAST—GENERAL

3F-2 The mainland from abreast Mys Alvatinniyemi trends about 24 miles south-eastward to Mys Styursudd (sec. 4D-1), the northern entrance point of Leningrad Guba. Three large islands, Ostrova Piy-sari, Koyvistto (Kovisto), and Torsaari, lie close together and front the northern part of this coast for nearly 15 miles. Proliv Koyviston (Koyvoston) Salmi lies between the islands and coast and although about 2 miles wide in places it narrows to less than 1 mile in vicinity of Zaliv Koyvisto, about 8 miles within the northern entrance of this sound. The harbor of Koyvisto lies in Zaliv Koyvisto.

Between the southern entrance of the sound and Mys Styursudd the coast is indented by several bays.

The coast in Proliv Koyviston Salmi rises gradually in a chain of hills to heights of 180 to 280 feet; numerous houses and villages stand on the slopes of these hills. The western sides of the islands are wooded and hilly. A remarkable hill rises to a height of 378 feet on Ostrov Torsaari, the middle and outermost island.

DEPTHS — DANGERS — OFF-LYING ISLANDS

3F-3 The depths in Proliv Koyviston Salmi, off the western side of the three islands, and off the coast southward of the islands are very irregular and there are numerous detached dangers interspersed throughout. The depths and dangers in the sound are described in sections 3F-5 and 3F-7.

Between the northern end ($60^{\circ}33' N.$, $28^{\circ}26' E.$) of the peninsula extending north-westward from the eastern shore of Vyborgskiy Zaliv (sec. 3E-5) and the northern entrance of Proliv Koyviston Salmi, about $5\frac{1}{2}$ miles south-southeastward, the coastal dangers lie within the 5-fathom curve, which lies about $\frac{1}{3}$ mile offshore. The detached dangers are described in section 3E-3.



Dangers westward of Ostrova Piy-sari, Koyvisto, and Torsaari.—The 10-fathom curve lies from less than 1 mile to about 2 miles off the western sides of these islands, but numerous detached patches, with a least depth of $2\frac{1}{2}$ fathoms, exist within about $6\frac{1}{2}$ miles westward of these islands. Between Mys Alvatinniyemi and Mys Ollinpyayaniyemi, the northwestern extremity of Ostrov Torsaari and located about $6\frac{1}{4}$ miles southward, there are several islets with foul ground surrounding them; the outermost dangers are a $2\frac{1}{2}$ -fathom shoal located about $2\frac{1}{2}$ miles southwestward of Mys Alvatinniyemi, a 5-fathom patch lying about $2\frac{1}{2}$ miles farther south-southwestward, and two patches, with a least depth of $1\frac{1}{2}$ fathoms, lying within $1\frac{1}{2}$ miles westward of Mys Ollinpyayaniyemi.

Off the western side of Ostrov Torsaari, which trends about 4 miles southeastward, the outermost dangers are two 5-fathom patches located about $6\frac{1}{2}$ miles southwestward of Mys Ollinpyayaniyemi and 5-fathom rocky patches located about $4\frac{2}{3}$ and $3\frac{1}{2}$ miles southwestward of Mys Pyayatiyenginniyemi, the southern extremity of the island; a 3-fathom rocky patch lies nearly 6 miles westward of the latter point and a dangerous wreck lies about $6\frac{1}{4}$ miles southwestward of the same point.

An area prohibited to anchorage and fishing lies about 3 miles southward of the southern extremity of Ostrov Torsaari.

Off the southwestern side of Ostrov Koyvisto, which trends about 5 miles east-southeastward from nearly 1 mile eastward of Mys Pyayatiyenginniyemi, there are several unmarked patches with depths of less than 5 fathoms within 3 miles offshore. The outermost danger, a 3-fathom patch marked with a spar buoy, lies about 4 miles southward of

Mys Pitkyaniyemi, the southeastern extremity of the island.

A lifesaving station is located on Mys Pitkyaniyemi.

The mainland from about $5\frac{1}{2}$ miles eastward of Mys Pitkyaniyemi to Mys Styursudd is fronted by a coastal bank, as defined by the 5-fathom curve, up to about $1\frac{1}{2}$ miles offshore. The outer ends of this bank are marked with spar buoys. A group of detached patches, some rocky, with a least depth of 3 fathoms, lies between about $2\frac{1}{4}$ and $3\frac{1}{4}$ miles offshore between about $4\frac{1}{4}$ miles southeastward of Mys Pitkyaniyemi and about 2 miles southwestward of Mys Styursudd; the northern, southern, and eastern ends of this group are marked with spar buoys. The fairway from Leningrad Guba to Proliv Koyviston Salmi leads between these dangers and the coastal bank.

Ostrov Torsaari.—The western side of this island is described above. On the northeastern side of the island there are several villages. A channel for 9-foot drafts leads between this land and Ostrov Piy-sari and thence between the latter and Ostrov Koyvisto into Proliv Koyviston Salmi. The channel is marked with range beacons and spar buoys, but local knowledge is essential.

Ostrova Piy-sari and Koyvisto.—The western sides of these islands are described in the preceding paragraphs. The eastern sides of these islands form the western side of Proliv Koyviston Salmi and are described with that feature in section 3F-5.

NAVIGATION

3F-4 From a position about 3 miles northeastward of Sommars (sec. 2C-6) a course of 107° for about $38\frac{1}{2}$ miles joins the off-

shore track leading into Leningrad Guba (sec. 2-2) at a position about 7 1/2 miles south-southwestward of Mys Styursudd. It leads over a least charted depth of 7 3/4 fathoms and passes between the dangers lying off this coast and those described in chapter 2.

PROLIV KOYVISTON SALMI (Bjorko Sund)

3F-5 Proliv Koyviston Salmi, described in section 3F-2, is the eastern approach to Vyborskij Zaliv for vessels with local knowledge. It was reported in 1960 that passage through Koyviston Salmi is prohibited and that vessels may only approach Vyborskij Zaliv by the main channel from southwestward. There are general depths of 8 to 18 fathoms in the sound and the fairway through it is well marked and available for 30-foot drafts. The sound affords sheltered anchorage, but southerly winds cause a heavy swell in its southern part.

THE NORTHERN PART OF THE SOUND, which is about 8 miles long between its entrance and Zaliv Koyvisto, lies between the eastern side of Ostrov Piy-sari and the mainland. There are several detached shoals and the coastal bank on either side of the sound is rather narrow; LIGHT BUOYS and SPAR BUOYS mark the dangers adjacent to the fairway.

A pair of LIGHTS on Kuninkaanniyemi, located on the northern part of Ostrov Koyvisto about 1 mile southwestward of Zaliv Koyvisto, in range 154° leads through the fairway in the northern part of the sound to within about 2/3 mile westward of the entrance of the bay. A LIGHT is shown on Mys Virtaniyemi, the southern point of the harbor of Koyvisto.

There is ANCHORAGE for 18-foot drafts between two islands located about 1 1/2 miles westward of Zaliv Koyvisto.

The channel narrows to about 1/3 mile in the vicinity of Mys Virtaniyemi.

ZALIV KOYVISTO

3F-6 Zaliv Koyvisto, occupied by the harbor of Koyvisto, is entered close northward of Mys Virtaniyemi. The bay is about 1/2 mile in extent and has depths of 3 to 5 fathoms in the entrance and 6 to 13 feet

within the bay area. There is ANCHORAGE in 7 to 10 fathoms, mud and fine sand, close westward of the bay entrance, and for small vessels in 2 1/4 fathoms, clay, close within the bay entrance. Anchoring and fishing are prohibited within an area about 1/2 mile wide between Ostrov Kovisto and Mys Virtaniyemi. The shoals lying about midway between the entrance points are marked with SPAR BUOYS. There is a church with a spire on the northern entrance point.

KOYVISTO HARBOR (Primorsk) has two piers extending from the southern side of the entrance. The southern pier has about 625 feet of berthing space on each side with a depth of 28 feet alongside. The pier close northward has about 140 feet of berthing space on each side with a depth of 10 feet. A pier, with about 900 feet of berthing space on each side and a depth of 10 feet alongside, extends southeastward from the northern side of the entrance. There are several smaller piers on the southern side of the harbor. The piers formerly located along the northern shore of the bay area and the piers southward of the main pier on the southern side of the entrance have been reported non-existent (1965). There is a lifesaving station with a motorboat and STORM SIGNALS are shown.

THE TOWN OF KOYVISTO, with a population of about 2,000, is engaged chiefly in lumber exporting. The customhouse is near the main piers, which are connected to the general railroad system. Fresh provisions and water are obtainable.

PROLIV KOYVISTON SALMI (Cont'd)

3F-7 THE SOUTHERN PART OF THE SOUND is about 7 miles long in a southeasterly direction between Mys Virtaniyemi and Mys Pitkyaniyemi. Ostrov Ravista, a small island about 7/8 mile southeastward of Mys Virtaniyemi, stands on foul ground that extends about 3/4 mile southeastward from it; a SPAR BUOY marks this extremity. A LIGHT is shown on the northern end of Ostrov Ravista. A 27-foot patch lies about 2/3 mile farther southeastward. A 29-foot patch, marked by a SPAR BUOY, lies near the middle of the sound nearly 1 mile west-southwestward of Ostrov Syarkkyaluoto. The mainland between Mys Virtaniyemi and Ostrov

Syarkkyluoto, about 6 miles southeastward, is bordered by a narrow coastal bank.

Lights are shown on Ostrov Syarkkyluoto, which lies near the outer end of the foul ground that occupies the entrance of an inlet, and on Ostrov Verkkoluoto, which lies close off Ostrov Koyvisto about $2\frac{1}{3}$ miles westward of Ostrov Syarkkyluoto.

Between Ostrov Verkkoluoto and Mys Pitkaniemi, about 2 miles southward, there are several dangers that lie within $1\frac{3}{4}$ miles of the shore; they are marked with spar buoys.

Anchorage can be taken anywhere in the sound, but the best anchorage is off Zaliv Koyvisto and between it and Ostrov Ravitsa in 8 to 14 fathoms, mud, gradually changing to sand near Ostrov Ravitsa.

Pilots for Proliv Koyviston Salmi and Gavan' Uuras (sec. 3E-6) can be obtained at Mys Verkkoniemi, about $\frac{3}{4}$ mile southward of Ostrov Verkkoluoto, and at Koyvisto.

Directions.—*From southward:* Enter the sound by steering 017° on Syarkkyluoto Light until Virtaniemi Light bears 313° . Thence steer in on that bearing until past Ostrov Ravitsa. From here proceed to about 1 mile west-northwestward of the latter light, being guided by the buoys marking the adjacent dangers. Thence proceed on a 334°

course through the northern part of the sound with the range lights on Mys Kuninkaanniemi in line astern.

From southeastward: From a position about 1 mile southward of Mys Styursudd steer a northwesterly course between the coastal and detached dangers described in section 3F-3 until Virtaniemi Light bears 313° and thence proceed through the sound as directed in above.

COASTAL FEATURES

3F-8 The coast between the southeastern entrance point of the inlet which is fronted by Ostrov Syarkkyluoto and Mys Styursudd, about 8 miles southeastward, is indented by several shallow bays. A light is shown on Kyorenniemi, about 4 miles southeastward of Ostrov Syarkkyluoto. The dangers fronting this coast are described in section 3F-3.

ANCHORAGES

3F-9 Proliv Koyviston Salmi.—See sections 3F-5 and 3F-7.

Zaliv Koyvisto.—See section 3F-6.

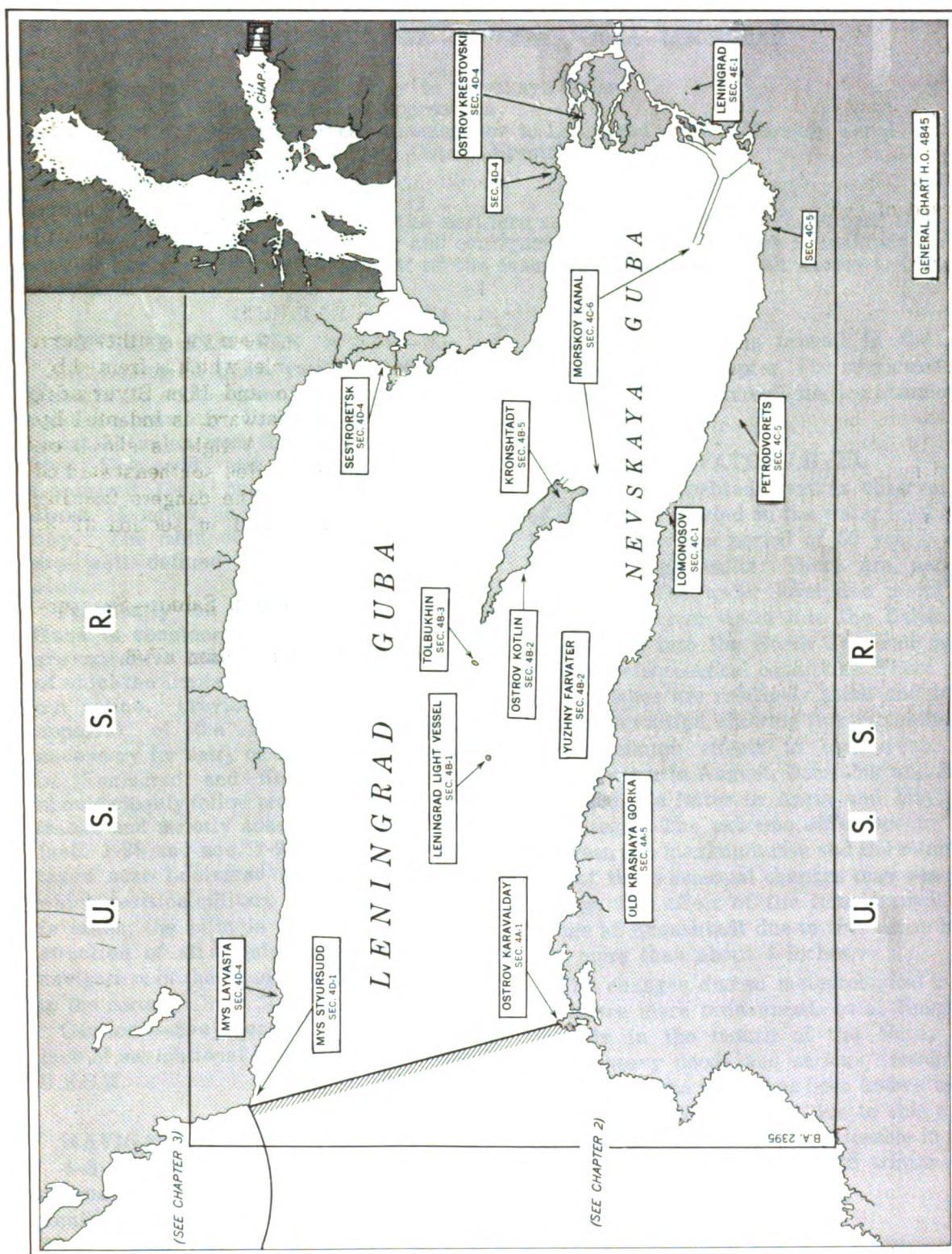


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
 Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 4—GRAPHIC INDEX

CHAPTER 4

LENINGRAD GUBA—NEVSKAYA GUBA—LENINGRAD

- Part A. Ostrov Karavalday to Nevskaya Guba
- Part B. Kronshtadt and approaches
- Part C. Nevskaya Guba—Lomonosov to Leningrad and the Morskoy Kanal
- Part D. Mys Styursudd to Ostrov Krestovski
- Part E. Leningrad

Plan.—This chapter describes the northern and southern shores of Leningrad Guba and Nevskaya Guba and the intervening and contiguous area, which includes Kronshtadt and the port of Leningrad. The arrangement of the coastal descriptions of both shores is from the westward.

GENERAL REMARKS

4-1 Leningrad Guba, including Nevskaya Guba in its southeastern part, extends in an east-southeasterly direction for a total of about 35 miles from the entrance points of Mys Styursudd and Ostrov Karavalday. Leningrad Guba has a greatest width of about 15 miles, in the eastern part of the bay. The main channels of the two bays are well defined by various navigational aids.

Practically the entire area of Leningrad Guba is considered a military zone. There are extensive zones prohibited to navigation of which the limits are liable to change without notice. Previous arrangement with the approval of the Naval Commandant is necessary for entry or departure of the ports of Leningrad and Kronshtadt. Vessels should closely follow prescribed navigational tracks and strictly adhere to all regulations (sec. 1-28 and sec. 1-29). A pilot must be taken near Leningrad approach buoy, from which position military control of the vessel is taken; the pilot is charged with the instruction of all regulations concerning the navigation in the channels and the entrance to the ports.

Caution.—See section 1-32 regarding lack of navigational information in waters of U.S.S.R.

NAVIGATION

4-2 See section 2-2. Directions for the approach to Kronshtadt and to the port of Leningrad will be found in sections 4B-1 and 4C-6, respectively.

ICE

4-3 Ice conditions prevail in the area covered by this chapter. For particulars see section 1-47 and consult the ice chartlets in chapter 1.

RANGE OF WATER LEVEL

4-4 At Kronshtadt regular observations of the effects of wind on the water level have been made over a period of 60 years, with the following results: There are periodic changes in the water level due mainly to the flow of river water into the Baltic Sea and thence into the North Sea, and partly due to meteorological conditions. These periodic changes are relatively small and follow a definite routine, showing two maximum and two minimum effects in each year. The former occur in August, December and January, and the latter in April, and May, and in October. The extreme difference in level between the maximum rise and the minimum fall of these seasonal changes may reach 11 inches. The effect of the tide is small, the range at Kronshtadt due to this cause being not more than about 4 inches.

The changes due to meteorological conditions are more pronounced, as at times, especially in the mouth of the Neva, they cause heavy floods and serious damage. At Kronshtadt the water has been known to rise about 4 feet in six hours due to this cause. These conditions are more noticeable in their effect during the autumn and winter than

during spring and summer. In general, easterly winds lower the water level and westerly winds raise it. The force of the wind is of greater consequence than its direction.

The water level begins to rise somewhat earlier than the freshening or shifting of the wind, and it attains its maximum height before the wind reaches its greatest force. Any appreciable rise of the water level is a certain indication of westerly winds. When certain conditions of wind and barometric pressure occur at the same time the rise of the water level may be considerable. At Kronshtadt an increase of 10 feet 3 inches above normal has been recorded, and in 1924 at Leningrad the rise was 12 feet 6 inches above normal. These extreme rises, which cause floods, are most frequent in October and November; the maximum rise at Leningrad during the months of February, March, April, and June has not exceeded 5 feet 10 inches. The maximum difference between the high and low level at Kronshtadt, during the last 100 years, is 15 feet 3 inches.

With winds from north-northeast through north to south-southeast the water rises at Kronshtadt and falls with those from other directions.

Part A. OSTROV KARAVALDAY TO NEVSKAYA GUBA

4A-1 Ostrov Karavaldy (Shepelev) (Shepelevskiy) ($59^{\circ}59' N.$, $29^{\circ}08' E.$), the southern entrance point of Leningrad Guba, is joined to the mainland by a shingle causeway. The island, encompassed by foul ground, is low and overgrown with bushes.

A light is shown and a fog signal is sounded on the northern extremity of Ostrov Karavaldy.

A measured distance is located about $2\frac{1}{2}$ miles eastward of Ostrov Karavaldy. The western end is marked by the alinement of a

beacon on the shore and a church about $\frac{1}{2}$ mile southward. The eastern end is marked by the alinement of 2 beacons.

A wreck lies sunk nearly $2\frac{3}{4}$ miles north-northeastward of the light on Ostrov Karavaldy.

COAST—GENERAL

4A-2 The coast is low between Ostrov Karavaldy and Saraia Lotchad Point, about $2\frac{1}{2}$ miles east-northeastward. At the latter point it begins to rise in a range of low hills, increasing in height as they trend eastward until, at Krasnaya Gorka Point 4 miles eastward, they form a red sandy cliff conspicuous from seaward and visible from westward for about 14 miles. From thereon to Verkhaya Bronnaya, about $9\frac{1}{2}$ miles farther eastward, and thence 4 miles beyond to Lomonosov, the coast is bordered by low sand hills.

The greater part of this coast is fringed by foul ground and there are several extensive shoal areas off the eastern half.

DEPTHS—DANGERS—OFF-LYING BANKS

4A-3 From Ostrov Karavaldy to a position about 12 miles eastward, the coast is fringed by foul ground which extends about $1\frac{1}{4}$ miles offshore near Krasnaya Gorka Point to about $2\frac{3}{4}$ miles at London Shoal. The edge of the foul ground, as defined by the 6-fathom curve, between Ostrov Karavaldy and Lebyazhaya, about $8\frac{3}{4}$ miles east-southeastward, is marked by spar buoys.

London Shoal, beginning close eastward of Krasnaya Gorka Point and lying along the coast for a distance of about $4\frac{1}{2}$ miles, extends offshore about $2\frac{3}{4}$ miles; the least depth on the main area of the shoal is 9 feet. Two spar buoys mark the northern side of the shoal.

Oraniyenbaumsкая Mel', lying close eastward of London Shoal, has depths of 2 to 18

feet; at the western end of the banks are patches marked by spar buoys.

Between London Shoal and the western end of Oraniyenbaumskaya Mel' are two spoil grounds lying about $\frac{1}{2}$ mile offshore, the western of which is marked by spar buoys. Another spoil ground lies on the western part of Oraniyenbaumskaya Mel'.

Oraniyenbaumskaya Kosa, which forms the eastern edge of Oraniyenbaumskaya Mel', has a least depth of 2 feet. The spit extends northward from Lomonosov for about $3\frac{1}{4}$ miles to the southern side of Malyy Reyd (sec. 4B-4).

NAVIGATION

4A-4 See section 4-2.

COASTAL FEATURES—LANDMARKS

4A-5 There is a bay about 2 miles eastward of Ostrov Karavaldy and immediately westward of Saraia Lotchad Point where small craft having local knowledge can find shelter from easterly winds in a depth of $1\frac{1}{2}$ fathoms.

A light ($59^{\circ} 58' N.$, $29^{\circ} 23' E.$) is shown at Old Krasnaya Gorka, about $7\frac{1}{4}$ miles eastward of Ostrov Karavaldy. A naval signal station is situated at New Krasnaya Gorka about $\frac{1}{2}$ mile eastward of Old Krasnaya Gorka.

The Lebyazhya River, about $1\frac{1}{2}$ miles east-southeastward of the light structure at Old Krasnaya Gorka, has the village of Lebyazhya at its mouth. Storm signals (sec. 1-16) are displayed at Lebyazhya. There is a pier, nearly 300 yards long, off the village.

A dumping ground, marked by buoys is located within an area, the center of which is about 5 miles east-northeastward of the light structure at Old Krasnaya Gorka.

Verkhaya Bronnaya, about 6 miles east-southeastward of Lebyazhya, has a conspicuous tower standing at an elevation of 296 feet about $\frac{3}{4}$ mile inland from the coast. A red church with a green spire and two domes, is situated about 2 miles northwestward of Verkhaya Bronnaya and is also conspicuous.

From hereon to Lomonosov there are several villages close inland which are backed by wooded areas.

4A-6 This section has been deleted.

Part B. KRONSHTADT AND APPROACHES

4B-1 Leningrad approach buoy ($60^{\circ} 02' N.$, $29^{\circ} 26' E.$) is moored about $9\frac{1}{4}$ miles east-northeastward of the northeastern end of Ostrov Karavaldy (sec. 4A-1).

Pilotage, compulsory for Leningrad, Kronshadt, and the minor ports of the area, is obtained in the vicinity of this buoy.

Light buoys.—Three light buoys, numbered from 1 to 3 in a west to east direction, are moored in the approach from westward to Leningrad approach buoy. The westernmost buoy is moored about $3\frac{1}{2}$ miles eastward of the northern end of Ostrov Seyskari; the easternmost buoy is moored about $3\frac{1}{4}$ miles northwestward of Ostrov Karavaldy.

A light buoy, with several mooring buoys close eastward of it, is moored about 7 miles east-northeastward of Ostrov Karavaldy.

Traffic signals.—The traffic signals (sec. 1-16) are displayed at the signal mast on the southern side of the Voyennaya Gavan' (Naval Harbor) at Kronshadt (sec. 4B-6). These signals regulate traffic in a 25-mile long shipping channel between Leningrad approach buoy and the port of Leningrad.

The shipping channel commencing at Leningrad approach buoy where it is known as Yuzhny Farvater leads to Kronshadt passing southward of Ostrov Kotlin where in front of Kronshadt three intermediary segments connect it with the Morskoy Kanal (sec. 4C-6) which leads through Nevskaya Guba to Leningrad. The traffic signals, international in character, have localized meanings as follows:

1. Three black balls by day or three red lights at night indicate that the channel from Leningrad approach buoy to Kronshadt is prohibited to merchant vessels. Vessels approaching from seaward must anchor to the seaward of Leningrad approach buoy and those coming from Leningrad must anchor in front of the signal mast at Kronshadt.

2. A cone point up between two balls by day or a white light between two red lights at night indicate that the Morskoy Kanal is

closed to east-bound traffic. Vessels bound to Leningrad must anchor to seaward of Leningrad approach buoy or, if they have passed the approach buoy, must anchor in Malyy Reyd (sec. 4B-4).

3. A cone point up between a cone point down and a ball by day or a white light between a green light and a red light at night indicate that the entire channel between Leningrad approach buoy and Leningrad is closed. Vessels approaching from seaward should anchor to seaward of the approach buoy, and those already eastward of the approach buoy should anchor in Malyy Reyd.

4. A cone point up between two cones points down by day or a white light between two green lights at night indicate that the Morskoy Kanal is closed to west-bound traffic.

Note.—Anchorage off Leningrad approach buoy should, in all cases, be taken within the area designated for such use which begins about 3 miles northwestward of the approach buoy.

Regulations.—The following extracts of the Harbor Regulations are pertinent to transit of the ship channel between Leningrad approach buoy and Leningrad:

1. The master of the vessel proceeding from sea to port shall first 48 hours then 24 hours prior to arrival inform "Inflot Leningrad" of the estimated time of arrival at Leningrad approach buoy as well as the port of departure, vessel's length and draft, number of passengers and a description and the amount of cargo stowed in each hold. Four hours before reaching the buoy, he shall report the exact time of arrival. When the duration of the vessel's passage is less than 48 hours, the estimated time of arrival should be sent from the port of departure.

2. All vessels entering the port are allowed a maximum draft of 27 feet (8.2 meters) carried at ordinary water level. Vessels with a greater draft may enter only on receiving in each separate case the permission of the Harbormaster.

Vessels with a draft of 24 feet (7.3 meters) and over must carry a black ball hoisted in a conspicuous place by day and an all around visible red light at night.

Vessels with a draft of less than 24 feet must keep clear of the above-mentioned vessels.

APPROACH CHANNEL

4B-2 Yuzhny Farvater (South Channel) is the approach to Kronshtadt from seaward. The dredged channel has a swept depth of 32½ feet for a width of 260 feet (1967).

The channel is marked by a range and a number of spar buoys.

Caution.—The limits of the prohibited areas in Russian waters are liable to be changed without notice and therefore those shown on the chart cannot be relied upon. In the absence of other instructions vessels bound to and from Kronshtadt must not deviate from the designated range line.

Ostrov Kotlin, about 14¾ miles east-northeastward of Ostrov Karavalday and 4 miles off the southern shore of Leningrad Guba, is about 6 miles in length and not over 1 mile in width. It is surrounded by an extensive shoal area on which there are several forts. The eastern and southern portions of this area extend to the shores of the mainland, the area eastward being further encumbered by sunken obstructions. The 3-fathom curve along the southern edge of this foul ground, between Ostrov Kotlin and the meridian of

Mys Lisiy Nos (sec. 4D-2), is marked by **spar buoys**. The edge of the shoal on the southwestern side of the island is marked by spar buoys. The 6-fathom curve at the western end of the shoal area lies about 4 miles from the westernmost end of the island.

DANGERS—OFF-LYING BANKS AND ISLANDS

4B-3 Tolbukhin, an islet, lies about $2\frac{1}{2}$ miles west-northwestward of Ostrov Kotlin and about $1\frac{1}{2}$ miles inside the 6-fathom contour just mentioned. A light is shown on Tolbukhin.

Severnaya Tolbukhinskaya, a shoal with a depth of 21 feet, has its northern extremity about $1\frac{3}{4}$ miles northward of Tolbukhin Light and is marked by a **spar buoy**.

Zapadnaya Tolbukhinskaya, a shoal with a depth of 23 feet, lies about $1\frac{1}{2}$ miles west-southwestward of the light structure on Tolbukhin with foul ground intervening. Foul ground lies on the southern edge of this shoal. **Spar buoys** are moored on the western side of the shoal and on the southern side of the foul ground.

Yuzhnaya Tolbukhinskaya, a shoal with a least depth of 10 feet, sand and rock, lies about $1\frac{1}{4}$ miles south-southeastward of Tolbukhin Light.

LANDMARKS—ROADSTEADS

4B-4 The town of Kronshtadt, situated at the southeastern end of Ostrov Kotlin, has a number of objects that are conspicuous when approaching the port; among them are the foundry chimney, the Naval Cathedral, St. Andrew's Cathedral, and the Lutheran Church.

Kronshlot Fort, situated about $\frac{1}{2}$ mile southwestward of Kronshtadt, lies on the

northern end of London Shoal at the inner end of Yuzhny Farvater.

Bolshoi Reyd (Great Road), extends from Kronshlot Fort in a west-northwesterly direction. In 1967 the channel was swept to a depth of 33 feet over a width of 260 feet. The seaward entrance, 560 feet wide, lies about $1\frac{3}{4}$ miles west-northwestward of Kronshlot Fort and is marked on its northern and southern sides by lighted whistle buoys with radar reflectors. The northern and southern sides of the roads are marked by a number of **spar buoys**. A **light buoy** is moored about $\frac{3}{4}$ mile west-northwestward of the light on the northernmost point of Fort Kronsholt and about 200 yards northward of the range line (091°) leading towards Kronshtadt. Off the northern part of the road are Roshal, Alesander (Alexander), and Pyotr (Peter) Forts, and in the southern part are No. 3 Battery, Pavel (Paul), and Kronshlot Forts.

Malyy Reyd (Little Road) lies between the western side of Voyennaya Gavan' and the eastern side of Oraniyenbaumskaya Kosa (sec. 4A-3), and was swept to a depth of 33 feet over a width of 260 feet in 1967. The western side of the road is marked by spar buoys. The northern side of Oraniyenbaumskaya Mel', extending east-southeastward from Kronsholt Fort, is marked buoys. Anchorage can be taken in 29 feet, mud, in Malyy Reyd about 900 yards southwestward of the light structure on the southeastern end of Voyennaya Gavan'.

Malyy Reyd is connected with Bolshoi Reyd by a channel nearly 1 mile long and about 280 yards wide.

Vostochni Reyd (Eastern Road) lies off the southeastern end of Kronshtadt and has depths of 10 to 16 feet. Shelter is afforded

small craft from westerly winds, but with strong easterly winds a heavy sea sets into the road. The edge of the shoal extending about 1 mile from the southeastern end of Kronshtadt is marked by spar buoys. A boat pier extends southeastward from the northeastern side of Kronshtadt. A light is shown on the head of the pier. A spar buoy is moored about $\frac{1}{2}$ mile east-southeastward of the pierhead. A light buoy is moored nearly $\frac{1}{2}$ mile eastward of the pierhead. Lights in range 311° stand on the Petroleum Pier, situated close northward of the boat pier.

Caution.—Vessels must not pass northward of a line drawn 290° from the spar buoy moored about $\frac{3}{4}$ mile eastward of the pierhead to the eastern end of Ostrov Kotlin.

Vessels must not anchor in the vicinity of the submarine cable (sec. 1-34) on the northern side of Vostochni Reyd.

KRONSHDTADT

Position: 59°59' N., 29°47' E.

Depths: Approach channel 32½ feet.
Anchorage, Malyy Reyd, 28 feet.
Harbors, 9 to 35 feet.
At quays, 9 to 35 feet.

4B-5 Kronshtadt, a naval base generally barred to civilian traffic, was formerly an important commercial port. It occupies the entire eastern portion of Ostrov Kotlin, approximately one-fourth the area of the island.

Navigation.—See section 2-2.

Ice.—See section 4E-4.

Currents.—The current in the roads of Kronshtadt sets to the westward about $\frac{1}{2}$ knot during moderate easterly winds, but may attain a rate of $1\frac{1}{2}$ knots during a strong wind.

Westerly winds will cause an easterly set and a rise in water level, after which the ebbing attains a velocity of 3 knots at times.

Lights.—Four pairs of lights in range 107°, 091°, 109°, and 315°, respectively, lead through Yuzhny Farvater, Bolshoi Reyd, and Malyy Reyd.

A light is shown on each side of the entrance of Kupecheskaya Gavan'; a fog signal is sounded on the southwestern corner of the western mole.

A light is displayed on the southeastern side of Lesnie Vorota when vessels are leaving or entering Srednyaya Gavan'.

A light is shown on the southeastern corner of Voyennaya Gavan' and a fog signal is sounded; another light is shown close northwestward of the afore-mentioned light.

A light is shown on the northernmost corner of Fort Kronshlot and a light is shown on each side of the entrance of the harbor on the eastern side of the fort.

A considerable number of fixed white lights are shown on the outer walls of the harbors at Kronshtadt.

4B-6 Harbors.—There are four separate harbors, all artificial, comprising the port of Kronshtadt. **Kabotazhnaya Gavan'** (Coasting Vessels' Harbor), the westernmost, has depths of 5 to 23 feet, the greatest depths being in the southern part. The entrance lies in about the center of the southern wall.

Kupecheskaya Gavan' (Commercial Harbor), next eastward of **Kabotazhnaya Gavan'**, has depths of 24 to 31 feet in the southern part and 6 to 17 feet in the northern part. There are two mooring buoys in the harbor. The entrance to the harbor is on the southern side and close southeastward of it is Fort **Menshikov**. A pilot station is located near the western wall. The customhouse is at the head of the harbor.

Srednyaya Gavan' (Middle Harbor), southeastward of **Kupecheskaya Gavan'**, is separated from it by the walls of the **Kanal Petra Pervogo**. There are four openings in the harbor wall with **Lesnie Vorota** the principal entrance. In the southern and eastern parts of the harbor there are depths of 28 to 35 feet; the northern part is shallow and available only for small craft. This harbor is for the use of naval vessels.

Kanal Petra Pergovo, having a total length of somewhat less than $\frac{1}{4}$ mile, penetrates the land area of the island about $\frac{1}{2}$ mile. At the inner end of the canal is a 200-foot-diameter turning basin from which project three short basins, each fitted with gates and capable of being used as dry docks.

Voyennaya Gavan' (Naval Harbor), southeastward of **Srednyaya Gavan'**, with which it is connected by an opening in the northwestern wall, has two entrances from **Malyy Reyd**.

Signals.—The signal mast at the southwestern corner of the wall of **Kupecheskaya Gavan'** is used for communicating with vessels by the International Code of Signals.

The following traffic signals are made from the signal station:

1. A red ball hoisted at the southern yardarm, or a red light, indicates that vessels cannot leave the harbor, the passage into the harbor is clear.

2. A white cross hoisted at the northern yardarm, or a white light, indicates that vessels cannot enter the harbor, the passage out of the harbor is clear.

3. A blue flag hoisted at the southern upper yardarm indicates that passage from

road to road is prohibited to cargo vessels.

4. A cone hoisted at the southern upper yardarm, or a green light, indicates that the passage into the harbor is closed.

The following signals concerning **Srednyaya Gavan'** are shown from a signal mast situated on the eastern wall at **Lesnie Vorota** about $\frac{1}{2}$ mile east-southeastward of Fort **Menshikov**:

A white ball by day, or a green light by night, at the southern yardarm indicates that the harbor is open for vessels entering but closed for vessels leaving. A red ball by day, or a red light by night, at the northern yardarm indicates that the harbor is open for vessels leaving but closed for vessels entering. The absence of any signals indicates that the harbor is closed to both entry and exit of vessels.

Storm signals (sec. 1-16) are shown at the naval semaphore mast on the roof of a building about 350 yards northward of the northwestern corner of **Srednyaya Gavan'**, and also from the signal mast on the wall at the southeastern extremity of **Voyennaya Gavan'**.

Time signals are indicated by a time ball dropped from the mast of the naval semaphore.

4B-7 Regulations.—For general regulations in the approach to U.S.S.R. harbors, see section 1-28.

All steam vessels approaching **Kronshtadt** from seaward must use the **Yuzhny Farvater**.

When proceeding through **Malyy Reyd** vessels shall keep at a distance of not less than 350 feet from the harbor wall, and proceed at a reduced speed; red boards with the inscription "**Малый Ход**" (Slow speed) in white, and a white arrow below it, are situated near the southwestern corner of **Kupecheskaya Gavan'** and at the southern corner of **Voyennaya Gavan'**.

When approaching the harbor gates, proceeding through narrow passages, surrounded by shipping or obstructions, and generally whenever a collision is possible, vessels shall

proceed at slow speed and sound a prolonged blast on the whistle.

Vessels intending to enter or leave the harbor shall, at a distance of about 100 yards from the gates, sound several prolonged blasts of the whistle to warn vessels on the other side of the wall. The gate shall not be approached by vessels intending to pass through until the passage is clear; this is shown by a signal hoisted at the signal mast at the entrance.

Directions.—From Leningrad approach buoy Yuzhny Farvater is entered with the light structure on the southern bastion of Fort Kronshtadt in range 107° with that on the southeastern wall of Voyennaya Gavan'. Alter course when the light structure at the entrance of Kabotazhnaya Gavan' is in range 091° with the one on the eastern side of Kupecheskaya Gavan' and steer on that bearing through the dredged channel of Bolshoi Reyd until the range light structures at the northwestern end of Voyennaya Gavan' come in line 109°. Proceed into Malyy Reyd on that range until the range light structures on the southern side of Kupecheskaya Gavan' bear 315°, astern; continuing on this range will lead beyond the harbor installations of Kronshtadt to the entrance of the Morskoy Kanal.

4B-8 Kronshtadt is a town with a population of about 25,000 (1951). The central part of the city is surrounded by a wall with three gates, suburbs lying beyond. There are four drydocks, the largest with a length of 820 feet, one floating drydock and other repair facilities for both hull and machinery, but it is difficult and expensive to secure the use of them for merchant vessels. Cranes, both stationary and floating, are available from the government for heavy lifts.

A railroad serves the island and off-lying forts. There is telegraphic and radio communication. A submarine cable connects with Mys Lisiy Nos and Lomonosov on the mainland. An airport is maintained on the northwestern part of the island. Traffic with the mainland is carried on by boat in the summer, and by sledge and motor vehicles over the ice in the winter.

There is at least one hospital that will admit seamen.

ANCHORAGES

4B-9 Leningrad approach buoy.—See section 4B-1.

Kronshtadt.—See section 4B-4.

Part C. NEVSKAYA GUBA—LOMONOSOV TO LENINGRAD AND THE MORSKOY CANAL

4C-1 Lomonosov (Oranienbaum) (59°55' N., 29°46' E.) is situated on the southern shore of Nevskaya Guba south of Kronshtadt. The town is about 21 miles from Leningrad by a suburban electric railway. A palace on a hill close westward of the town, the railroad station, and Martyshkina church, about 1¾ miles southeastward of the palace, are conspicuous.

The main harbor area, protected on its east and west sides by breakwaters, has depths of 12 to 20 feet with a depth of 20 feet alongside the principal quays. A canal leads from the southwestern part of this area to a quay near the railroad station; depths in the canal vary from 12 feet near its entrance to 7 feet near the railroad station. Eastward of the harbor area is a small boat harbor with a depth of 7 feet. Still farther eastward is an area reserved for seaplanes; a white and red buoy with a white wind vane is moored near the middle of this area.

Two channels lead to the harbor areas at Lomonosov. The western channel, with a depth of 20 feet, leads to the main harbor area. A pair of lights, named Oranienbaumski, in range 186° lead through this channel.

A light buoy is moored in the approach to the western channel about 800 yards southward of the light on the southwestern corner of the wall of Voyennaya Gavan' (sec. 4B-6).

A **light buoy** is moored on the eastern side of the channel about $1\frac{1}{4}$ miles northward of the front range light.

The **eastern channel**, with a least depth of 7 feet, has a pair of **lights** in range 206° leading to the piers at Lomonosov. A **light buoy** is moored on the line of range nearly 1 mile from the front range light. The channel is further marked by **spar buoys** on either side.

There are repair facilities for small steamers at Lomonosov. A radio station is maintained. There is steamer connection with Leningrad.

Prohibited anchorage.—Anchorage is prohibited in an irregular-shaped area beginning off the harbors of Kronshtadt (sec. 4B-6) and extending south-southwestward to the mainland nearly $\frac{3}{4}$ mile westward of the curved moles at Lomonosov. A **spar buoy** marks its northeastern limits.

Close eastward of the afore mentioned prohibited anchorage is another like area indicated as extending between Kronshtadt and Lomonosov. A **spar buoy** marks its northeastern limits.

The **telegraph cable** between Kronshtadt and Lomonosov is marked by buoys. Vessels are prohibited from anchoring on or near the line of these buoys.

Storm signals (sec. 1-16) are displayed and a lifeboat is maintained at Lomonosov.

COAST—GENERAL

4C-2 Nevskaya Guba, lying between Kronshtadt and the mouth of the Neva, about 12 miles east-southeastward, has shores that are mostly low and marshy, and backed by

wooded areas about 1 mile inland. Many villages are situated along the southern shore of the bay. This entire stretch of coast is fringed by foul ground, and the area between the shore and the Morskoy Kanal (sec. 4C-6) is shoal. A number of indicated spoil grounds in Nevskaya Guba are marked by **spar buoys**.

DEPTHS—DANGERS

4C-3 Depths in this area are uneven and, except in the dredged channels, do not exceed 19 feet, with generally less water throughout. The 1-fathom curve, extending up to $\frac{3}{4}$ mile offshore, has a great number of sunken rocks between it and the coast. Numerous unmarked rocks, dangerous to navigation, are positioned outside this contour.

CURRENTS

4C-4 The current in Nevskaya Guba sets westward in midchannel between Ostrov Kotlin and Mys Lisiy Nos at a velocity of about $\frac{1}{4}$ knot, but in the southern area of the estuary it is weaker. During light easterly winds there is a westerly set with a velocity of about $\frac{1}{2}$ knot and with strong winds from that direction attains a velocity, at times, of about $1\frac{1}{2}$ knots. No current is perceptible along the shores of the estuary.

COASTAL FEATURES

4C-5 Petrodvorets (Peterhof) ($59^\circ 53' N.$, $29^\circ 55' E.$), about $4\frac{1}{2}$ miles eastward of Lomonosov, has numerous sunken rocks and rocky patches with depths of 4 to 8 feet in the vicinity; caution is therefore necessary when approaching the port.

Conspicuous buildings in the town are the palace with its golden emblem, the cathedral

of Saints Peter and Paul, the Peterhof cathedral, the Aleksandria palace, and the cemetery chapel. About $\frac{1}{2}$ mile westward of the town is the former yacht basin and two wooden piers in ruins.

The town is connected to the general railroad system, and there is regular communication by steamer with Leningrad. There is one airfield at Petrodvorets and another $3\frac{3}{4}$ miles southward at Nizino.

A lifeboat is maintained during the summer months.

The **Voyennaya Gavan'** (Naval Harbor), at the outer end of a broad mole, has depths of 8 to 11 feet, mud. The entrance at the north-eastern angle of the harbor is 135 feet wide; in calm weather a vessel may berth along the outer side of the northern and eastern walls. A canal, 33 feet wide, leads from the harbor to the palace.

There are two channels leading to the **Voyennaya Gavan'**. The western channel has lights in range $182\frac{1}{2}^{\circ}$, leading to the harbor from its junction with the **Morskoy Kanal** (sec. 4C-6). This junction point is marked by a spar buoy moored about $2\frac{3}{4}$ miles northward of the front range structure at Petrodvorets. The channel is marked by buoys.

The eastern channel is available for vessels drawing not more than 8 feet. The western side of the channel is marked by a light buoy moored about midway along the channel and several spar buoys. Port hand

channel buoys mark the inner half of the channel. Lights in range 240° lead through the fairway of the channel. The western and eastern channels have a common front range light.

A 7-foot patch, about $1\frac{1}{4}$ miles north-northeastward of the front range structure at Petrodvorets, is marked by a spar buoy.

The coast between Petrodvorets and Strel'na, about $4\frac{1}{2}$ miles east-southeastward, is fringed with foul ground extending up to 1 mile offshore. There are several bathing piers, in a dilapidated condition, projecting from the shore. There is a pier at which small craft can lie alongside, or they can anchor off its western side; the anchorage off the town is poor. A health resort, having a pier with a depth of 6 feet at its outer end, is situated on the shore near the central part of the town; a canal leads inland for a short distance from close eastward of the pier.

The Sergievsk church, about $\frac{3}{4}$ mile eastward is conspicuous from offshore.

A lifeboat is maintained at Strel'na during the summer months.

MORSKOY KANAL (MORSKOI CHANNEL)

4C-6 The **Morskoy Kanal**, extending in an east-southeasterly direction from the southern side of Malyy Reyd (sec. 4B-4) at Kronshadt to the mouth of the Neva (sec. 4E-1), has a total length of about 16 miles. The first 10 miles of the channel leads through the open water of Nevskaya Guba, then between

two moles for about $2\frac{3}{4}$ miles farther, wherefrom it curves gradually to the northeastward and joins the Neva. The channel has a dredged depth of 10 m (33 ft.) for a width of 200 feet.

Buoyage.—The open-water part of the Morskoy Kanal is marked by spar buoys (see sec. 1-11).

The western entrance to the channel is marked by a light buoy. One pair of light buoys are moored about $\frac{1}{2}$ mile within the western entrance. A pair of lighted bell buoys are moored $4\frac{1}{2}$ miles from the western entrance. Thence, two other pairs of light buoys mark the channel as far as the moles. Several of the light buoys have radar reflectors.

Lights.—Range light structures are situated on the northern end of Oraniyenbaum-skaya Kosa (sec. 4A-3) about $\frac{3}{4}$ mile southeastward and $\frac{1}{2}$ mile west-southwestward, respectively, of the light structure on the southernmost side of Fort Kronshlot. These lights in range 292° lead through Morskoy Kanal. Owing to an inclination of the front light tower, it tends to deflect the light toward the northern edge of Morskoy Kanal,

and caution is therefore necessary when on this range. The lights are not visible westward.

A light is shown on the outer end of the northern mole at the inner end of Morskoy Kanal, and a light is shown on the outer end of the southern mole. Each of these lights is fitted with a radar reflector. A light is shown on the northern mole about $2\frac{1}{2}$ miles southeastward of the light at the head of the mole.

Two lights, one of which is the front light of a range, are shown on the northwestern end of New Mole. A light shown near the southeastern end of the same mole is the rear light of the above range. These lights in range about 112° lead through Morskoy Kanal from seaward.

There are several other lights on the heads of inner moles and at the entrance of the Neva. Northwestward of New Mole the channel is marked by light buoys.

Regulations.—The greatest speed permitted in the open part of the channel is 10 knots, and 6 knots within the moles. Any vessel unable to navigate at 6 knots or under must be towed. Vessels must proceed at their slowest

speed when passing moored or towed vessels, dredges, cranes, and similar craft.

Vessels drawing 24 feet and over must keep to midchannel and carry a black ball at the foremast by day, and an all-round red light at night.

Vessels, with drafts exceeding 27½ feet, require special permission to enter the port.

Just within the head of the southern mole the wall of the mole is angled outward for about 725 yards thereby widening the waterway at this point to allow space for vessels to moor out of the channel. This area, which is used by vessels carrying explosives, has three mooring buoys available.

Wrecks.—Several dangerous sunken wrecks lie close outside the limits of Morskoy Kanal and are marked by buoys.

Part D. MYS STYURSUDD TO OSTROV KRESTOVSKI

4D-1 Mys Styursudd (Mys Seyvyast) (60° 11' N., 29° 01' E.), the northern entrance point of Leningrad Guba, projects about 350 yards westward from the mainland.

A light is shown about ½ mile east-northeastward of the extremity of Mys Styursudd; storm signals (sec. 1-16) are also displayed.

Dangers off Mys Styursudd.—From about 2½ miles southward of Mys Styursudd, a shoal area with least depths of 5.5 to 9.1 m (3 to 5 fms.) extends for about 8 miles in a general northwesterly direction parallel to the mainland. Diomid (60°07'N., 29°00'E.), the southernmost danger with a depth of 8.2 m (4 1/2 fms.) and marked on its southeastern side by a spar buoy, lies about 4 1/2 miles south-southwestward of Mys Styursudd. An obstruction lies about 5 1/4 miles southward of Banka Diomid. The depths and dangers northwestward of Diomid are described in section 3F-3.

COAST—GENERAL

4D-2 The northern shore of Leningrad Guba between Mys Styursudd and Mys Inonniyemi, about 13 miles eastward, is moderately high and mostly wooded. There is a high hill about 2½ miles eastward of Mys Styursudd.

Between Mys Inonniyemi and Mys Dubovskiy, about 14½ miles east-southeastward, several rivers discharge into the bay, none of which have any navigational importance.

Between Mys Dubovskiy and Mys Lisiy Nos, about 5 miles southward, the coast is low, sandy, and wooded, and from thereon to Ostrov Krestovski, about 8 miles farther east-southeastward, the shore is low and marshy.

The greater part of this coast is fringed by foul ground and there are several extensive shoal areas off the eastern section.

DEPTHS—OFFSHORE DANGERS

4D-3 From a position about ¾ mile southward of Mys Styursudd the 10-fathom curve trends east-southeastward for about 4½ miles and thence eastward for about 9 miles to a position about ¾ mile southward of Mys Inonniyemi; it contains the coastal dangers, up to 1½ miles off, along this section of coast.

From hereon the 6-fathom curve follows the general contour of the coast, increasing its distance off the land until it lies up to about 4½ miles offshore as it approaches Mys Dubovskiy, where it turns quite sharply westward. It contains all dangers except Udarnik, a shoal patch lying about 4½ miles southeastward of Mys Inonniyemi and having a depth of 9.1 m (5 fms.), and a dangerous wreck covering 1.8 m (1 fm.), lying about 3 miles south-southeastward of Mys Lautaranta. Udarnik is marked by a middle ground buoy.

The area from the mainland southwestward to Ostrov Kotlin is encumbered with shoals and sunken obstructions.

Between Mys Lisiy Nos and Ostrov Krestovski, about 8 miles east-southeastward, a shore bank borders the coast and extends nearly 1 mile with depths of less than 6 feet in places.

Two low rocky islets lie close offshore about $1\frac{1}{2}$ and 2 miles, respectively, southeastward of Mys Lisiy Nos; the eastern islet is Verper Luda.

COASTAL FEATURES—LANDMARKS

4D-4 Between Mys Styursudd and Mys Inonniyemi a number of small villages lie close inland.

Mys Layvasta lies about 4 miles eastward of Mys Styursudd. A light is shown on the point. There is a landing pier and shelter for small craft at the village of Iokykulya, about $\frac{1}{2}$ mile northeastward of Mys Layvasta.

Mys Lautaranta is located about $11\frac{1}{2}$ miles eastward of Mys Layvasta. A wreck lies stranded about 1 mile southwestward of Mys Lautaranta.

Sestroretsk, a town situated about $1\frac{1}{4}$ miles east of Mys Dubovskiy, is connected to the general railroad system. Its harbor, with depths of 9 to 12 feet, lies about $1\frac{1}{2}$ miles northward of the cape; anchorage can be had off the harbor in depths of 3 to 4 fathoms. A lifeboat is maintained at Sestroretsk.

A mole, extending southwestward and having at its head a small basin formed by wooden breakwaters, lies about $\frac{1}{4}$ mile southward of Mys Lisiy Nos. Small craft can find shelter here in a depth of about 10 feet. Mys Lisiy Nos may be identified by a red building near the shore. A lifeboat is kept at Mys Lisiy Nos during the summer months.

Between Mys Lisiy Nos and Lakhta, about 6 miles eastward, there are groups of houses.

The tower of the Biological Institute, about $5\frac{1}{4}$ miles east-southeastward of Mys Lisiy Nos, and the unused Lakhtinskaya Rescue Station, $1\frac{1}{2}$ miles farther eastward, are conspicuous. A small T-head pier is situated close eastward of the institute tower.

Sabakina Shoal, located between the rescue station and Ostrov Krestovski, has several islets lying on its southeastern part. Elagin Channel, leading into the northernmost branch of the Neva, separates the shoal from Ostrov Krestovski.

ANCHORAGES

4D-5 Sestroretsk.—See section 4D-4.

Part E. LENINGRAD

Position: 59°56' N., 30°18' E.
Depths: Morskoy Kanal approach, 32½ feet draft.
 Lower Harbor, 18 to 30 feet.
 Upper Harbor, 28 to 40 feet.
 At moorings, 22 to 28 feet.
 At quays and piers, 14 to 31 feet.
Port plan: See section 4E-11.

4E-1 The port of Leningrad is situated on Nevskaya Guba at the mouth of the river Neva. It is both a naval and commercial port and is connected with the interior, the White Sea, and Astrakan on the Caspian Sea, by several canal systems.

APPROACHES

4E-2 Directions for the approach to the entrance of the Morskoy Kanal, and passage through it leading to the port of Leningrad, are given in sections 4B-1 and 4C-6.

WATER-LEVEL—CURRENTS

4E-3 The water-level at Leningrad is not subject to tidal influence and fluctuations are caused principally by winds, with only slight effect from spring thaws and freshets. Strong westerly and southwesterly winds cause the level to rise, attaining a maximum of 7 feet above mean water level; the greatest recorded fall, from opposite winds, is 3 feet. The average variation is from about 1.5 feet below to 3.0 feet above mean water level.

The stream velocity of the Neva averages about $1\frac{3}{4}$ knots, increasing to 3 knots with northerly winds and becoming weaker during westerly winds.

ICE

4E-4 The port of Leningrad is closed by ice for about 15 weeks each year. The average date of closing is January 22, and of opening May 5. The thickness of ice averages 2.3 feet and is never more than 3.3 feet. A number of ice breakers are stationed at the port and these are used to lengthen the navigational season to the greatest extent possible. Buoys and other aids may be removed before the closing and after the opening of navigation in order to prevent their being carried away by the moving ice.

Ice breakers were able to keep the port of Leningrad open during the entire winter of 1959-1960 for the first time in 250 years.

For further particulars see section 1-47 and consult the ice chartlets in chapter 1.

DEPTHS

4E-5 The Morskoy Kanal approach is dredged to 32½ feet. From Lower Harbor to Upper Harbor, a distance of about 2 miles, a lateral artificial channel, an inner extension of the Morskoy Kanal, has depths of 31 to 32 feet.

It was reported (1965) that the controlling depth of Morskoy Kanal was 35 feet.

In Upper Harbor to Lieutenant Shmidt Bridge (Most Leytenant Shmidta), the southernmost of seven bridges which cross the Neva in its passage through the city, there are depths of 28 to 40 feet. This bridge is the upper limit of navigation for vessels drawing over 15 feet. Vessels of less draft can proceed up the Neva to Ladozhskoye Ozero (Lake Ladoga).

No free-swinging anchorage berths are available in the port, and all ships not at wharves are required to secure to mooring buoys in depths of 22 to 28 feet.

The various wharves for oceangoing vessels have depths of 18 to 30 feet; at the Petroleum Wharf, 30 feet; at the Coal Basin, 20 to 26 feet; the Grain and Timber Basin, 18 to 29 feet; East Basin, 19 to 28 feet; and Gutuyevskaya Gavan', 16 to 23 feet. The Customs Wharf has depths of 27 to 29 feet alongside.

There are four natural channels in the delta of the Neva by which small vessels can cross the bar of the river without using the dredged Morskoy Kanal. These channels, with depths of 7 to 10 feet, lead directly from Nevskaya Guba into the Neva and its several branches and are marked by numerous lighted buoys and buoys.

ASPECT—LANDMARKS

4E-6 The entire Leningrad area is comparatively low, varying from 16 feet in the southern and eastern sections to 33 feet in the northern part.

When approaching the port the Admiralty, a large building 244 feet high with a gilded tower, is conspicuous. It is situated on the southern bank of the Neva nearly ½ mile

above Lieutenant Shmidt Bridge. The gilded dome of Isaac Cathedral, close southward of the Admiralty, is very conspicuous as is the gilded, lofty spire of the cathedral rising from the Fort Peter and Paul, which is situated on the opposite shore of the Neva north-northeastward of the Admiralty.

HARBOR

4E-7 The deep water port of Leningrad occupies both shores of the Neva below the Lieutenant Shmidt Bridge and that portion of the delta to the southward. It is divided into Lower Harbor and Upper Harbor, the two joined by the inner section of the Morskoy Kanal.

Lower Harbor, entered from the westward by the Morskoy Kanal (sec. 4C-6), is contained in its southwesterly part by South Mole, in its northwesterly portion by North Mole and Ostrov Kanonerskiy, and to the eastward by the mainland.

Gutuyevskaya Gavan' (Morskoy Port), which is about 600 yards long, 240 yards wide, and has depths of 16 to 29 feet, is entered from the northeastern end of the Morskoy Kanal.

The Grain and Timber Basin, 1,250 yards long and 570 yards wide, with depths of 21 to 30 feet, is situated in about the central part of Lower Harbor and is open to the southward. It is bounded northward by Ostrov Volni, eastward by Grebenka Mole, and westward by Levaya Damba (Left Mole). On the eastern side of Grebenka Mole is East Basin, 1,200 by 270 yards, with depths of 19 to 28 feet; it has Ostrov Gladkiy as its eastern limit.

Coal Basin, lying at the inner end of Morskoy Kanal where it enters Lower Harbor from seaward, is confined by New Mole to the northeastward and South Mole to the southwestward. The basin is about 1,900

yards long and 700 yards wide and has depths of 26 to 28 feet.

SIGNALS

4E-8 Signals are made by the International Code of Signals during the day and by the Morse system at night from a signal mast on the head of the western mole at the entrance to the Neva from Morskoy Kanal.

Traffic signals are hoisted on the lower of two yardarms on the signal mast:

1. When approaching the Neva from Morskoy Kanal vessels must sound one long blast of the whistle and must not proceed any farther until a black ball or a red light is hoisted.

2. When one vessel is entering the Morskoy Kanal from the Neva and one is leaving the channel at the same time, a black cross or a white light is hoisted to indicate that the former is to be given precedence.

3. When a vessel is bound into Gutuyevskaya Gavan' from Morskoy Kanal she must sound a long blast of the whistle and must not proceed until a black ball or a red light is hoisted.

Water level signals (sec. 1-16) forecasting a rise of water are hoisted at the southern upper yard arm of the signal mast.

Storm signals (sec. 1-16) are shown from a mast on the roof of the Naval Academy, situated on the northern bank of the Neva about 700 yards below Lieutenant Shmidt Bridge.

Ice signals giving the state of the ice in the eastern part of the Gulf of Finland are hoisted at the northern upper yard arm in the form of black balls, which will not be replaced by lights at night.

1. One ball indicates ice from Leningrad to Kronshtadt.

2. Two balls, vertical, indicates ice from Leningrad to the meridian of Mys Styursudd.

3. Three balls, vertical, indicates ice from Leningrad to the meridian of Narva.

4. Three balls, vertical, with a fourth ball hoisted to the left of the top vertical ball, indicates ice from Leningrad to the meridian of Ostrov Sur-Sari.

5. Three balls, vertical, with a fourth and fifth ball hoisted to the left of the first and second balls, respectively, indicate ice from Leningrad to the meridian of Mohni.

6. Two groups, each consisting of three balls, vertical, hoisted alongside each other, indicates ice from Leningrad to Naissaar and beyond.

7. Two balls, horizontal, indicates that ice driving is expected on the Neva.

Note.—The intermediate limits of the spread of ice are not given; it must be understood that the limits of the ice-covered area, as indicated by the signals, are approximate only.

Harbor regulations are available in English and vessels should obtain a copy upon arrival.

PILOTS

4E-9 Pilotage is compulsory for vessels proceeding to Leningrad. Pilots may be obtained in the vicinity of Leningrad approach buoy (sec. 4B-1) or embarked in the approach to Yuzhny Farvater (sec. 4B-4). The pilot station in the port is on Ostrov Lotsmanskiy (Podzorni), about 1¼ miles below Lieutenant Shmidt Bridge. Pilots will not take vessels into the harbor at night.

Requests for pilot service should be made 8 hours before arrival; this request should be repeated after 4 hours.

DIRECTIONS

4E-10 See section 4C-6, regarding navigational aids and speed regulations concerned in the transit of the Morskoy Kanal.

FACILITIES

4E-11 Leningrad is centered on the delta of the Neva and is crossed by two main arms of the river as well as by several minor branches and artificial channels. A number of bridges connect the various segments, augmented by ferries and steamers. A large metropolis, with a wide range of light and heavy industries, it had a population of about 3,200,000 in 1960. Lumber, pulpwood, and grain exports are the bulk of the port commerce. Available berthing space for oceangoing vessels totals about 29,560 linear feet in depths of 18 to 30 feet.

Customs and quarantine stations are located here.

The U.S. has no consular representation in the port.

Berths.—Petroleum Wharf, at the outer end of South Mole in Lower Harbor, can accommodate two vessels in depths of 30 feet for the discharge of petroleum products or bunkering.

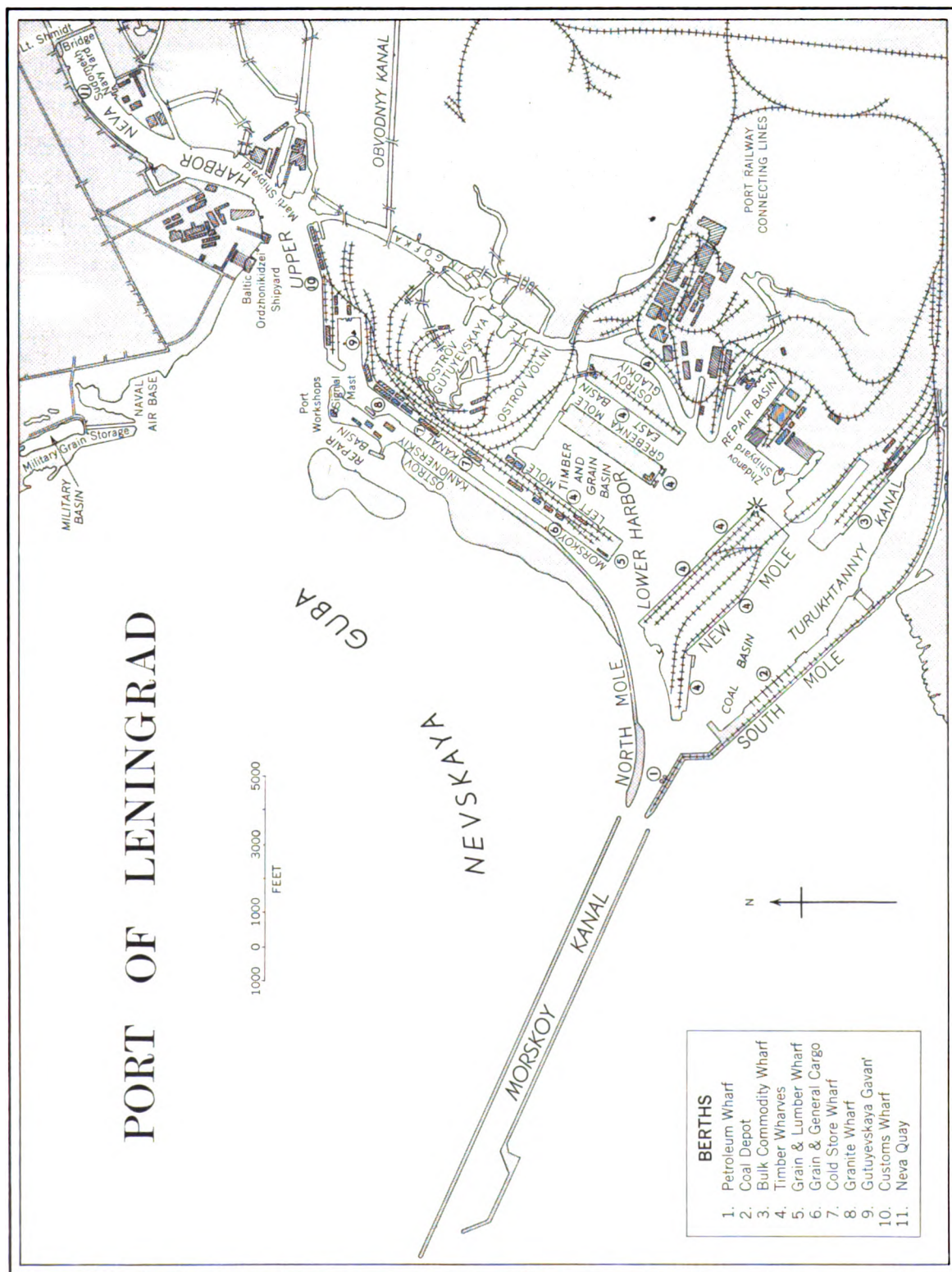
Coal Depot wharves on South Mole, Lower Harbor, have lengths of 2,800 and 1,000 feet with limiting drafts alongside of 15½ feet. The coal wharf and mechanical facilities in Lower Harbor were reported to be in poor condition in 1962. A wharf, 2,600 feet long, for the handling of bulk commodities, is situated on the northern side of Turukhtanny Kanal nearly ½ mile southeastward of the Coal Depot; there are depths of 23 feet alongside.

New Mole has timber wharves on the southwestern and northeastern sides with lengths of 5,600 and 4,400 feet respectively. The southwestern wharf has depths of 18 to 26 feet alongside and the northeastern wharf has depths of 16 to 24 feet alongside.

Ostrov Gladkiy has two timber wharves, one for receiving lumber by barge and the other for its shipment in oceangoing vessels. The wharf on the southeastern side of the island has a length of 4,050 feet and a depth of 10 feet alongside; that on the northwestern side of the island has a length of 3,250 feet and 19 to 26 feet alongside and is the principal lumber export wharf in the port.

Grebenka Mole with its 210-foot long offshore wharf, has a depth of 26 feet alongside except for the southernmost third of its east side. The eastern limit of the lesser depths extending from this part of the mole is marked by a buoy moored near the center of East Basin. The eastern side of the mole is about 3,300 feet long; oceangoing vessels can berth alongside. This pier has railroad connections and is equipped with several cranes of about 5-tons capacity. There is a wharf about 280 feet long, used by lighters, north-eastward of the molehead.

Left Mole has docking space at its head and along both sides. The southeastern side has 2,700 feet of berthing length with depths ranging from 18 feet at the root of the mole to 26 feet near the head; lumber is handled here. The head of the mole, with 700 feet along its face, and the adjoining side areas near the head with 720 feet each have depths of 25 to 26 feet. Lumber and grain are the two commodities dealt with at this location. On the northwestern side of Left Mole is 1,300 feet of berthing space with 23 to 29 feet alongside. General cargo and grain are moved at these wharves; a grain processing building and two grain elevators are located at the rear of the wharf. A passenger ferry is operated between Left Mole and Ostrov Kanonerskiy.



Two cold storage wharves and Granite Wharf are situated on the southeastern side of Morskoy Kanal and are a continuation northeastward of Left Mole. The cold storage wharf nearest Left Mole has a length of 550 feet with a depth of 23 feet alongside. The cold storage wharf adjoining the Granite Wharf has a berthing length of about 700 feet with a depth of 29 feet alongside. Granite Wharf, with a length of about 1,800 feet and 29 feet alongside, is used in the handling of general cargo.

Gutuyevskaya Gavan' (Morskoy Port), situated at the extreme northeastern end of the Morskoy Kanal, is commercially important in the discharge of general cargo and has an available berthing length of about 3,350 feet with depths of 16 to 29 feet alongside. This basin is the free port for Leningrad.

Customs Wharf on the south bank of the Neva in Upper Harbor, immediately northward and east-northeastward of Gutuyevskaya Gavan', is important in the handling of general cargo and passengers. It has about 3,570 feet of docking space with 29 feet alongside.

Neva Quay on the north bank of the Neva, Upper Harbor, has a length of about 3,970 feet with 14-to 20-foot depths. General cargo is handled here.

The above-mentioned wharves, with the exception of Neva Quay, have adjacent railroad (5'00" gage) connections which are linked with the general railroad system.

A passenger terminal, with five deep-water berths, reception centers and transportation facilities, was under construction in 1959 at the southwestern end

of the Bolshoy development northward of the Neva Gates.

Future plans call for increased storage and mechanization, improved and deepened berths, and additional road and rail clearance throughout the port area.

There are about 90 steam and motor tugs and 2,000 lighters operating in the port.

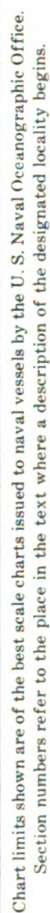
There are floating cranes in the area consisting of one each of 350, 200, 150, 100, 70, 50, and 40 tons; there are two of 35 tons each. Several 5-ton mobile cranes are located on Customs Wharf.

Repairs.—Major repairs can be made. There are a number of floating drydocks and a marine railway available for commercial use. The dimensions of the largest floating dock in the port are: maximum length, 426½ feet; inside width, 100 feet; lifting power, 6,000 tons.

Supplies.—Fuel oil and diesel oil are obtainable and coal may be taken aboard at the Coal Depot or from lighters. Water is piped to the principal wharves and is also supplied by waterboats to vessels at moorings. Drinking water should be boiled. Fresh provisions may be obtained.

Communications.—There is railroad and steamship communication with all parts of Europe, and airline service for passengers, mail, and freight. Telephone, telegraph, and cable services are available. A radio station is maintained.

Deratization.—For information concerning deratization see section 1-7.



CHAPTER 5—GRAPHIC INDEX

CHAPTER 5

ÅLAND ISLANDS AND THE ADJACENT COAST OF FINLAND

- Part A. Hangöudd to Utö
- Part B. Utö to Maarianhamina
- Part C. Western side of Åland Islands
- Part D. Northern side of Åland Islands to the Finnish coast
- Part E. Turku and approaches

Plan.—This chapter describes the Åland Islands and those extending from the Finnish coast. The arrangement is westward from Hangöudd to Södra Kvarken, thence eastward to Enskär. Then the inner fairways to Turku are described.

GENERAL REMARKS

5-1 The Åland Islands (Ahvenanmaa) lie in the middle of the entrance to the Gulf of Bothnia. They are separated from the Swedish coast by Ålands Hav and Södra Kvarken (sec. 6B-2) and are joined to the southwestern part of Finland by numerous islands, rocks, and shoals. The area is contained between Hangöudd and Signildskär, about 110 miles west-northwestward, and between Signildskär and Enskär, located about 10 miles off the Finnish coast about 78 miles northwestward of Hangöudd and 59 miles east-northeastward of Signildskär.

The islands are irregularly shaped; the larger are heavily wooded and of moderate height and the smaller are rocky, bare, and low. Fairways for deep-draft vessels lead between these islands to Maarianhamina, a port of Åland Island, the largest of the group, to Turku, on the Finnish mainland within the islands, to Hanko (sec. 3A-6), and to Uusi-kaupunki (sec. 8A-10).

Ålands Hav (Ahvenan Meri) lies between Eckerö, Åland, and Lemland, the western part of the Åland Islands, and Vaddö and

Björkö, which lie close off the Swedish coast. It is the principal entrance to the Gulf of Bothnia. It is about 17 miles wide and 36 miles long from Flötjan to Södra Kvarken, at its northwestern extremity. There are general depths of 26 to over 100 fathoms.

Submarine cables (sec. 1-34) extend from Åland Island to the Swedish and Finnish coasts and between these coasts, passing close off the northern side of the Åland Islands.

NAVIGATION

5-2 From the Gulf of Finland: From a position about 10 miles northward of Aegna Island (sec. 2A-11) a course of 261° for about 123 miles leads to the southern edge of the bank about 18 miles east-southeastward of Bogskär (sec. 5B-4). This course joins the coastal track of the northern shore of the Gulf of Finland about 10 miles southward of Russarö (sec. 3A-4). When at the southern edge of the above-mentioned bank a course of 283° for about $12\frac{1}{2}$ miles leads to a position about $2\frac{1}{2}$ miles south of Bogskär. These courses clear all dangers and

pass over a least charted depth of 17 fathoms southward of Bengtskär (sec. 5A-2).

For Ålands Hav: From the position $2\frac{1}{2}$ miles southward of Bogskär a course of 318° for about $61\frac{1}{2}$ miles leads to a position about 7 miles eastward of Svartklubben Light (sec. 6C-1). This course leads northeastward of Svenska Björn Light Vessel (See H. O. Pub. No. 142) and the light buoy moored about 5 miles northwestward and about $1\frac{1}{2}$ miles southwestward of Flötjan (sec. 5B-4). The least charted depth passed over is 7 fathoms on the bank northward of Svenska Björn Light Vessel.

Directions for entering the Gulf of Bothnia via Södra Kvarnen are given in section 6B-6.

Abnormal magnetic disturbances exist among the islands covered by this chapter. The areas principally affected are: within 15 miles southeastward of Utö; about 10 miles southwestward of Utö; between Lågskär (sec. 5B-4) and Maarianhamina, and the eastern part of Ålands Hav; about 15 miles southward of Enskär.

ICE

5-3 Ice conditions prevail in the area covered by this chapter. For particulars see section 1-47 and consult the ice chartlets in chapter 1.

WINDS—WEATHER—CURRENTS

5-4 Among the islands southwesterly winds prevail; southeasterly winds are accompanied mostly with rain; northerly winds are squally.

Fogs occur in the spring and autumn. They are thick and dry in the spring and damp with fine rain in the autumn.

Currents are generally dependent on the direction of the wind, but are strongly diverted by the islands and shoals. The water level is a good indication of expected winds. A rise precedes winds from southeast or southwest and a fall precedes those from northward.

Part A. HANGÖUDD TO UTÖ

5A-1 Hangöudd and the dangers adja-

cent and lying up to 8 miles southward of it are described in section 3A-1.

GENERAL

5A-2 Between Hangöudd and Utö, about $46\frac{1}{2}$ miles westward, the islands, rocks, and shoals are so numerous as to render navigation among them dangerous. Only vessels locally acquainted should attempt a passage. Numerous dangers lie seaward of the regular trend of the islets toward Utö. The outer dangers are: Bengtskär, a rock with underwater rocks within $2\frac{1}{2}$ and 3 miles west-southwestward and westward of it, about 13 miles west-southwestward of Hangöudd; a $3\frac{1}{2}$ -fathom shoal about $18\frac{1}{4}$ miles west-southwestward of Bengtskär; Lillharu, the southern of a group of above- and below-water rocks, about $3\frac{1}{4}$ miles south-southeastward of Utö; a $3\frac{3}{4}$ -fathom shoal about $5\frac{3}{4}$ miles southeastward of Lillharu; shoals with depths of $3\frac{1}{2}$ to 5 fathoms about 6 miles farther eastward.

NAVIGATION

5A-3 See section 5-2.

Navigational aids.—A light is shown on Bengtskär. A fishing light is shown on a rock eastward of Ljusskär. Fishing lights are also shown from Prackonskär and Måsklubb, about 4 and $6\frac{1}{2}$ miles northward of Bengtskär.

A light is shown from Lillharu.

A spar buoy is moored on the $3\frac{3}{4}$ -fathom shoal southeastward of Lillharu.

A radar reflector is located on a group of above-water rocks which lie about $4\frac{1}{2}$ miles southeastward of Lillharu.

FAIRWAYS FROM HANGÖUDD TO UTÖ —DANGERS

5A-4 A fairway for 24-foot drafts leads along the northern side of the islands lying between Hangöudd and Utö. This fairway is well-marked with range lights and beacons and the adjacent dangers with spar buoys, but passage should not be attempted without local assistance.

Pilotage is compulsory and pilots are available at Hanko (sec. 3A-12) and Utö (sec. 5B-1).

Utterklint is an islet at the western limit of foul ground extending about $1\frac{1}{4}$ miles westward and northwestward from Hangöudd. The fairway from Hanko passes between the dangers southwestward of Hanko (sec. 3A-5) and then passes westward of Utterklint and trends northeastward, skirting the foul ground and passing between it and the dangers close northwestward.

Fläckgrund lies about $3\frac{1}{2}$ miles northward of Utterklint and Galtarna ($59^{\circ}55' N.$, $22^{\circ}37' E.$) lies about $7\frac{1}{2}$ miles west-northwestward of Fläckgrund. The fairway, after passing about 1 mile northeastward of the above-mentioned foul ground, trends northwestward, passing about $\frac{1}{4}$ mile southward of Fläckgrund, and thence leads west-northwestward to pass close northward of Galtarna.

Navigational aids.—A light is shown on either side of the fairway about 1 mile northeastward of Utterklint.

A pair of range beacons stands on Utterklint and marks the fairway through the foul ground. A beacon stands on a rock about $\frac{3}{4}$ mile northeastward of Utterklint. A pair of range beacons stands on islets on the foul ground eastward of Utterklint and marks a branch of the fairway leading westward from that islet.

A lighted spar buoy is moored on the edge of foul ground adjacent to the western side of the fairway about $\frac{1}{4}$ mile north-northeastward of Utterklint.

A pair of range lights is shown in the northern part of Hanko and marks the fairway southward of Fläckgrund.

A light is shown on Fläckgrund.

A radar reflector, consisting of a black steel plate on a steel pole, is located on the southern side of the fairway about $3\frac{3}{4}$ miles west-northwestward of Fläckgrund.

A light is shown on Galtarna and in range with another light on Tokholm, about 3 miles west-northwestward, marks the fairway leading towards Galtarna.

A light is shown on Ledharu about $1\frac{1}{2}$ miles east-southeastward of Galtarna.

Idskär lies about $2\frac{1}{4}$ miles westward of Galtarna. After rounding Galtarna, the fairway trends west-southwestward, passing between Idskär and Idskärskubb, a shoal close southeastward. Thence it trends southwestward and passes close southeastward of Järngrund, about $2\frac{1}{2}$ miles southwestward of Idskär, and rounds Helgskär ($59^{\circ}53' N.$, $22^{\circ}25' E.$), about $1\frac{1}{2}$ miles farther west-southwestward, close southward and trends west-northwestward toward Bergskärs Västra, about $2\frac{1}{2}$ miles west-northwestward of Helgskär.

A branch of the fairway for 24-foot drafts leads westward from Utterklint and thence northwestward between the islands to join the main fairway about midway between Galtarna and Idskär. It is marked with range beacons and spar buoys.

Navigational aids.—Lights are shown from Trutgrund, from Idskar, from Idskarskubb and from Järngrund. A radar reflector with a topmark is on the roofs of the Idskarskubb and Järngrund Light structures.

A light is located on foul ground extending about 200 yards southward from Helgskär. A spar buoy is moored close southward of the light. A spar buoy with a radar reflector is moored on the southern side of the channel in a position about $\frac{1}{2}$ mile westward of the light.

A light is shown from a beacon on Vitklubb, an islet about $\frac{3}{4}$ mile southwestward of Helgskär, and in range with a beacon on an islet about $\frac{1}{2}$ mile west-southwestward marks a branch of the fairway from Järngrund to Helgskär.

Fjärdskär Light stands on the bank close southward of Fjärdskär in a position about $\frac{1}{4}$ mile west-northwestward of Helgskär.

A pair of range light beacons is shown on Bergskärs Västra and an islet about $\frac{1}{2}$ mile west-northwestward and marks the fairway

from Helgskär. Another pair of range lights is shown from the southern end of *Långholm*, the island about 1 mile eastward of *Bergskärs Västra*, and an islet about $\frac{1}{2}$ mile eastward and marks the fairway trending westward from that position.

5A-5 *Vänö*, about 1 mile in length and partly wooded, lies about $3\frac{3}{4}$ miles west-southwestward of *Bergskärs Västra*.

From close southward of *Bergskärs Västra*, the fairway leads westward to *Järnkläppar*, two rocks located on a patch of foul ground about $8\frac{3}{4}$ miles westward. Thence it passes southward of these rocks and between them and an islet group, about $1\frac{1}{2}$ miles in length, about $\frac{1}{4}$ mile southward. The fairway then trends west-southwestward and passes close northward of *Borstö* ($59^{\circ}52' N.$, $21^{\circ}58' E.$), about $2\frac{3}{8}$ miles west-southwestward of *Järnkläppar*, and between two islet groups lying about $\frac{1}{4}$ mile apart about $\frac{3}{8}$ mile westward and 1 mile west-northwestward of *Borstö*. Thence it trends westward again, passing $\frac{1}{4}$ mile northward of two rocks about $2\frac{2}{3}$ miles westward of *Borstö*, and thence passes about $\frac{1}{4}$ mile southward of a chain of rocks and islets extending about $5\frac{3}{8}$ miles westward from the northern of the latter islet group.

Navigational aids.—A pair of range light beacons on *Järnkläppar* marks the fairway from *Bergskärs Västra*. A light beacon on the northern end of *Västerland*, an islet in the middle of the group southward of *Järnkläppar*, in range with a beacon on an islet about $\frac{1}{2}$ mile westward, and the same light in range with a beacon on an islet at the eastern end of the same group marks the fairway between these dangers.

A pair of range lights located close southward of the beacons on *Västerland* and on the islet westward marks the fairway between the islet groups westward and north-westward of *Borstö*.

A beacon stands on the westernmost rock of the group westward of *Borstö* and adjacent to the fairway. A pair of lights is shown from the islet group and *Borstö* and marks the fairway passing close southward of the islet chain previously mentioned. Three beacons stand on islets in the western part of this chain; a pair of range lights is shown on the two western beacons ($59^{\circ}52' N.$, $21^{\circ}45' E.$) and marks the fairway through *Jurmofjärd*.

Jurmo ($59^{\circ}50' N.$, $21^{\circ}36' E.$), a 70-foot island, lies about 6 miles east-northeastward of *Utö* (sec. 5B-1). It is about $2\frac{3}{4}$ miles long and sparsely wooded on its southern side. A red-colored church on the northern side constitutes a good landmark for the vicinity. Detached dangers lie up to $\frac{1}{2}$ mile off the northern side of the island.

Jurmofjärd lies between the northern side of *Jurmo* and the dangers about 2 miles northward. There are general depths of 13 to 68 m (7 to 37 fms.), mud and sand. A light is shown from a beacon standing on a rocky patch about 1 mile northward of *Jurmo*. A spar buoy is moored on a 2.7 m (1 $\frac{1}{2}$ fm.) shoal about $2\frac{1}{3}$ miles westward of the western end of the island chain previously mentioned. The fairway passes close southward of this buoy and trends west-southwestward towards *Uto*.

FAIRWAYS AND LOADING PLACES NORTHWARD OF HANKO

5A-6 *Rilaks* ($59^{\circ}56' N.$, $23^{\circ}05' E.$), a loading anchorage about $9\frac{1}{2}$ miles northeastward of *Hangöudd*, lies between the islands off-lying the western side of a fiord; there is a pier here with a depth of 2.1 m (7 ft.) alongside. Vessels anchor in 14.6 m (8 fms.), sand, eastward of a monument on the shore.

The fairway for 24-foot drafts, marked with beacons, ranges, and spar buoys, branches about 1 mile northeastward of

Utterklint and trends north-eastward toward Rilaks.

Framäs lies at the head of the fjord, about 4 miles northeastward of Rilaks. There is 22 to 28 m (12 to 15 fms.), sand and stones, at the loading anchorage about 1/2 mile offshore. A fairway for 17-foot drafts leads from Rilaks and thence to Bromarv.

Bromarv (59°59'N., 23°02'E.), about 3 miles north-northwestward of Rilaks, lies at the head of an inlet extending west-southward from the head of the fjord. A church in the town is a good landmark. There is a pier with a depth of 3 m (10 ft.). Vessels load at the anchorage off Bromarv in depths of 12.8 to 16.4 m (7 to 9 fms.), sand.

Forby, about 17 miles northward of Hangöudd, lies on the western side of Sarkisalo (Finby), a large island fronting the southern entrance to the Kimitojoki. There is a depth of 5.5 m (18 ft.) alongside a pier at the northern end of Forby and several other piers, with depths of 2.7 to 3.6 m (9 to 12 ft.) alongside, close southward. A church in the southern part of the town is a good landmark. A short railroad connects the piers with limepits about 1/2 mile northeastward.

A fairway for 16-foot drafts passes eastward of Fläckgrund and joins a fairway for 18-foot drafts trending northeastward from the main fairway between Fläckgrund and Galtarna. These fairways continue northward along the western side of Padva, and thence northeastward to about 3 miles southward of Förby. A branch for 18-foot drafts also trends east-northeastward to a loading anchorage for a sawmill at Hakkala, about 5 miles east-northeastward of Förby. Local assistance is required for vessels navigating these fairways.

A light is shown on Stubbkål, an islet on the western side of the fairway, about 4 miles northward of Fläckgrund.

Stromma (60°11' N., 22°53' E.) lies about 6 miles northward of Förby between the mainland and the island of Kemiö (Kemito), close westward. There is a sawmill with a

wharf at which there is a depth of 4.3 m (14 ft.). There is a depth of 5.5 m (18 ft.) in the outer harbor and 3.6 m (12 ft.) in Stromma Kanal which lies between Kemio and the mainland. This depth is available to Teijo about 5 miles northeastward and to the loading anchorage for Salo about 3 1/2 miles farther northeastward and westward of Vartsalo where a sawmill is located.

Part B. UTÖ TO MAARIANHAMINA

5B-1 Utö (59°47' N., 21°22' E.) is a barren, hilly island and the largest of a group. There is a pilot station and a lifeboat is maintained. Pilots may be picked up 2 miles southward of Utö.

There is a radio station at Utö and the island is connected to Turku by telephone.

Utö Light is shown from the island. A fog signal is sounded and a radiobeacon transmits from the lighthouse.

GENERAL

5B-2 Between Utö and Maarianhamina, about 46 1/2 miles west-northwestward, the islands and adjacent dangers lie in close succession and are only broken by Kökarsfjärd, about midway between the island and the port. The off-lying dangers extend up to 9 miles southward from the regular trend of the islands. The outer dangers are Kökarsören, an island about 10 1/2 miles westward of Uto, with 6.4 to 9.1 m (3 1/2 to 5 fms.) shoals within 4 1/4 miles southeastward, southward, and southwestward of it; Karlbybadar, a rock about 8 3/4 miles west-southwestward of Kokarsören, with 3.9 to 6.4 m (2 1/4 to 3 1/2 fms.) shoals between it and Kokarsören and within 5 3/4 miles west-southwestward through 9 miles westward of it; a 7.3 m (4 fm.) shoal about 11 1/4 miles westward of Karlbybadar; and Nyhamn, with foul ground lying about 3 miles south-southeastward of it and extending eastward toward the islets, about 7 miles southward of Maarianhamina. Dangerous wrecks lie about 4 miles west-southwest and about 16 miles south-southwest of Uto Light.

Flötjan and Lågskär, the outermost dangers southward of Maarianhamina, are described in section 5B-4.

Passages leading to the inner channels are available at Utö and Nyhamn for 29½-foot and 27-foot drafts, respectively, and at Kökarsfjärd for 21-foot drafts. Although well-marked with navigational aids, passage is not recommended without local knowledge.

Lights are also shown on Bogskär, Flötjan, Lågskär, and on Lilla Båtskar at Nyhamn pilot station.

NAVIGATION

5B-3 See section 5-2.

Vessels bound for Utö from a position about 2½ miles southward of Bogskär may steer 066° for about 32 miles to a position about 3½ miles southwestward of Lillharu and thence continue as directed in section 5B-5. The former course passes over a least depth of 21.9 m (12 fms.) and its nearest approach to any danger is at the departure position.

Vessels bound for Nyhamn from a position about 1 2/3 miles westward of Flotjan may steer 037° for about 9 3/4 miles to a position about 1 1/2 miles southwestward of Nyhamn.

From a position about 7 miles eastward of Svartklubban Light, in Södra Kvarken, a course of 128° for about 29 miles leads over depths greater than 46 m (25 fms.) to a position about 1 1/2 miles southwestward of Nyhamn.

DEPTHS—OUT-LYING DANGERS

5B-4 The depths are very irregular and many dangers are scattered between the islands and the outlying dangers. There are 22 to over 92 m (12 to 50 fms.) in navigable waters and most of the fjords.

Bogskär (59°30' N., 20°21' E.), the southernmost danger of the islands, lies about 35 miles southwestward of Utö. A light is

shown on the western rock, and a beacon stands on the eastern rock about 2½ miles northeastward. Foul ground and dangers lie between the rocks and up to 1 mile northward of the western rock.

Flötjan (59°49' N., 19°47' E.) lies on the southwestern extremity of foul ground extending in patches about 4½ miles west-southwestward from Lågskär, which lies about 7 miles south-southwestward of Nyhamn. Foul ground extends eastward and northeastward from Lågskär to join the regular line of the islands. A spar buoy is moored on a 4.9 m (2 3/4 fm.) shoal about 2 miles southeastward of Lagskar. Lights are shown on Flotjan and Lagskar.

Banks.—Several banks, with depths of 7.3 to 18.3 m (4 to 10 fms.), lie between a position about 13 miles east-southeastward of Bogskar and a position about 8 miles farther northeastward.

A large bank with depths of 3.6 to 18.3 m (2 to 10 fms.) lies about midway between Bogskar and Lagskar; the 3.6 m (2 fm.) depth is located about 10 1/2 miles northward of Bogskar. Several detached patches with depths of 12.8 to 17.7 m (7 to 9 3/4 fms.) lie westward and southward of this bank.

Several banks, with depths of 10.9 to 18.3 m (6 to 10 fms.), lie in the locality about 9 miles south-southeastward of Flotjan and about 4 1/2 miles northward of Svenska Björn Light Vessel (See H.O. Pub. No. 142).

APPROACHES TO UTO

5B-5 Lillharu, on the eastern side of Uto approach, and the dangers eastward and southward of it have been described in section 5A-2. A 9.1 m (5 fm.) shoal lies about 3/4 mile southwestward of Lillharu.

Foul ground lies up to 1/4 mile southwestward and westward of Uto and the other islands in the group. Patches of foul ground lie interspersed between Uto and Knivskar and Torvskar, about 2 and 3 1/2 miles northward. A 6.7 m (3 3/4 fm.) shoal lies about 2/3 mile southward of Uto.

Svartbadan, a rocky area about 2 miles southwestward of Uto, is on the western side of the approach. It is marked by a lighted beacon. A 7.7 m (4 1/4 fm.) spot close eastward and a 0.9 m (3 ft.) spot about 1 mile southwestward of the lighted beacon, are marked by a spar buoy.

Tratten is an islet about 1 mile westward of the southern end of Uto. Foul ground lies westward of Tratten and a 2.1 m (1 1/4 fm.) and a 3 m (1 3/4 fm.) shoal marked by spar buoys lie about 7/8 of a mile and about 2 miles respectively, northward. A 4.7 m (2 1/2 fm.) shoal lies about 1 mile westward of Knivskar.

Navigational aids.—Lights are shown on Uto, Knivskar, Torvskar, Svartgrund, about 1 mile northeastward of Knivskar, Eglonskar, about 2/3 mile southeastward of Torvskar, and on Eglo and Tratten. Bokullasten Light stands about 1 1/2 miles east-northeastward of Torvskar. Range lights in line 130 1/2° are shown on islands about 2 1/4 miles eastward of Torvskär and lead from northwestward towards Jurmofjärd (sec. 5A-5) and Utö.

Lights, beacons, and ranges are located on the northern part and the adjacent islands of Utö and mark the fairway for 10-foot drafts to an anchorage close northward of Utö. Spar buoys mark the adjacent shoals according to the uniform system (sec. 1-13).

A pair of range light beacons is located on islets close southeastward and 1/2 mile west-southwestward of Torvskär and marks the fairway for 24-foot drafts from Jurmofjärd (sec. 5A-5).

A cairn stands on Knivskar. A 5.8 m (3 1/4 fm.) shoal lies about 1/2 mile northward of Knivskar and is marked on its eastern side by a spar buoy.

Directions.—Approaching Uto from southward steer 009 1/2° with Uto lights in line, thence 351° with Skatskar lights in range, thence pass westward and northward of

Knivskar and between Svartgrund and Eglonskar and proceed northeastward to Turku, or steer eastward on the range lights shown near Torvskar into Jurmofjärd.

Caution must be exercised to avoid the 2.7 m (1 1/2 fm.) shoal, marked by a spar buoy, located about 1/2 mile northeastward of Knivskar and the 4.3 m (2 1/2 fm.) shoal, marked by spar buoys and Eglo light, about 1 mile north-northeastward of Knivskar.

APPROACHES TO KOKARSFJÄRD

5B-6 Kokar (59°56'N., 20°51'E.), the western extremity of which is 17 1/2 miles northwestward of Uto, is a group of partly wooded islands. Numerous dangers and unsurveyed areas lie between this group and the dangers on the western side of the fairway to Uto and extend southward to a 4.5 m (2 1/2 fm.) shoal about 2 1/2 miles south-southeastward of Kokarsören. The latter shoal lies 13 1/2 miles south-southeastward of the western side of Karlbylandet, the western island of the group. The western side of the island of the group. The western side of the islands are steep-to.

A detached 6.4 m (21 ft.) marked with spar buoys, lies about 3 2/3 miles southeastward of Kokarsören.

Kokarsfjärd lies westward of Kokar and is about 5 miles wide. There are depths of 37 to 110 m (20 to 60 fms.) with many dangers interspersed throughout. A fairway for 21-foot drafts leads through the deep eastern side of the fiord. There are several dangers adjacent to the fairway. The most important dangers are: an 8.2 and a 9.1 m (4 1/2 and a 5 fm.) shoal with spar buoys moored on each about 4 miles southward and 4 1/4 miles southwestward of Kokarsören; a 6.4 and a 5.8 m (3 1/2 and a 3 1/4) shoal about 3 and 5 miles west-southwestward of Kokarsören; a 7.6 m (4 1/4 fm.) shoal about 4 1/4 miles westward of Kokarsören; and patches of foul ground, with a least depth of 4.5 m (2 1/2 fms.), about 4 1/2 miles southward of the western end of Karlbylandet and extending about 1 3/4 miles farther south-southeastward.

A cairn stands on Söderharun, an islet about $1\frac{1}{4}$ miles west-southwestward of the western end of Karlbylandet.

Foul ground lies on the western side of the fairway about $\frac{1}{2}$ mile northwestward of the northwestern side of the Kökar group.

A light is shown on Karskär, an islet about $1\frac{1}{2}$ miles north-northeastward of the western end of Karlbylandet, and a church stands on Hamno, an island between Karbylandet and Karskär. A light is shown on the northern end of Karlbylandet. A light is shown from an islet about $1\frac{1}{2}$ miles northward of Karlbylandet.

The fairway for Käkarsfjärd leads between the above shoals by passing between the 9.1 and 6.4 m (5 and 3 $\frac{1}{2}$ fm.) shoal and thence between the 5.8 and the 7.6 m (3 $\frac{1}{4}$ and the 4 $\frac{1}{4}$ fm.) shoal. Thence it leads between the dangers lying between Karlbylandet and Käkarsören and the foul ground patches southward of the western end of Karlbylandet. Thence it passes along the western side of that island and on either side of Karskar.

Pilots are available at Espskär, an islet close southward of Karlbylandet. A line-throwing apparatus is kept on the islet.

At Karskär, a branch of the fairway available for 16-foot drafts leads eastward and northeastward and joins the fairway for 27-foot drafts to Turku at Rödskär ($60^{\circ}07' N.$, $21^{\circ}19' E.$), about $16\frac{1}{2}$ miles northeastward. Range beacons in line 052° are located on an islet close eastward of Karskär and lead in the entrance of this channel.

Salsö ($60^{\circ}04' N.$, $20^{\circ}45' E.$) is the eastern and middle of a group of islands, steep to on their northern and eastern sides. A light is shown on Salsö. It is the pilot station for the vicinity. There is a signal station where storm signals (sec. 1-17) are displayed.

Submarine cables (sec. 1-34) lie between the island group and Salsö. They also extend to Husö about 1 mile eastward and thence south-southeastward to the islands of Kökar.

FÖGLÖFJÄRD—APPROACHES—DANGERS

5B-7 Föglöfjärd lies about 18 miles west-northwestward of Karlbylandet between Lemland, the southeastern part of Åland Island, and Flisö, about $21\frac{1}{2}$ miles east-southeastward. It is about $5\frac{1}{2}$ miles in length and $2\frac{1}{4}$ miles wide. There are depths of 29 to 35 m (16 to 19 fms.), mud. The fjord is practically landlocked by the numerous small islands. There is a narrow fairway entering from southwestward for 27-foot drafts; a fairway for 27-foot drafts continues from its northern part to Turku. Safe anchorage is provided in any part of the fjord, but care must be taken to avoid submarine cable crossing the fjord between the southwestern point of Flisö and the eastern point of Lemland.

Bjorkor lies about 3 $\frac{1}{4}$ miles southwestward of the southwestern point of Flisö. Islets and dangers lie between the islands. Foul ground extends about $\frac{1}{4}$ mile eastward and southeastward from Bjorkor. Shoals, with depths of 3.9 to 5.0 m (13 to 16 $\frac{1}{2}$ ft.) lie about $\frac{1}{2}$ mile northeastward and eastward of Bjorkor and also $\frac{1}{2}$ mile southeastward of an islet on the foul ground extending southeastward from Bjorkor.

Dangers.—The following are the outermost dangers southward of Foglofjärd.

Sextant, a 3.9 m (2 $\frac{1}{4}$ fm.), lies about $15\frac{3}{4}$ miles northward of Bogskar (sec. 5B-4) and about 9 miles westward of Karlbybada. A 7.3 m (4 fm.) shoal lies about 3 miles southwestward of Sextant.

Ytterbada, a rocky patch with depths less than 3.6 m (12 ft.), lies about $4\frac{1}{4}$ miles southeastward of Bjorkor. Vastra Fastor, a rock, lies about 1 $\frac{1}{2}$ miles southeastward of Ytterbada. Dangers lie within about 2 $\frac{7}{8}$ miles southeastward and between the rock and Käkarsfjärd.

Foul patches, with a least depth of 1.2 m (4 ft.), lie between 2 and 3 1/2 miles southwestward of Vastra Fastor. A shoal, with a depth of 2.1 m (7 ft.), and a rock, with a depth of 1.2 m (4 ft.), lie between about 1 3/4 and 3 1/4 miles southeastward of Bjorkor.

Western approach — Dangers. — Nyhamn pilot station, referred to in this volume as Nyhamn, although the islet of Nyhamn lies about 1 1/4 miles northward, comprises an area, about 1 mile in extent, consisting of several small islets lying on foul ground. It is the outermost feature on the northern side of the western approach to Föglöfjard. Pilots are stationed on the largest islet of the group. Detached shoal patches, with a least depth of 2.1 m (7 ft.), lie between about 1 3/4 and 3 1/2 miles eastward of the group; spar buoys mark the outer ends of the patches. The dangers on the southern side of the fairway and those farther eastward are described in section 5B-8.

A light is shown on the largest islet and a light with range lights nearby is shown on the southernmost islet of the group.

Stora Lökskär lies about 2 1/2 miles northeastward of Nyhamn. Foul ground extends about 200 yards off its southern and eastern sides. A light is shown on the island.

Rödhamn lies about 1 1/2 miles eastward of Stora Lökskär and is formed by several small islands lying off the southwestern part of Lemland. Navigational aids are located on Längö and Rödö, the southernmost islets of the group. A pair of lights in range 062° is shown on Längö and indicates the fairway from Nyhamn. A light on Rödö in range 307° with a light on Längö indicates the fairway between the dangers southward of Ledskar.

A fog signal is sounded, a radiobeacon transmits, and a radio direction-finder is operated on Längö. Beacons stand on these islets and another close northward of Längö. Spar buoys are moored on the edge of foul ground extending about 200 yards westward from Längö. Fairways for 12-foot drafts lead into this harbor from the northward, southward, and southeastward.

5B-8 Ledskar (59°58' N., 20°10' E.), about 2 1/4 miles southeastward of Rödhamn, lies about 1/2 mile south-southwestward of the southern extremity of Lemland. Foul ground skirts this point about 1/4 mile off and extends about 1/2 mile southwestward from it to within 150 yards northward of the islet. The northern side of the islet is steep-to and foul ground lies up to 150 yards off the southern side. A light is shown on the northern part of the islet. Shoals, with depths of 6.4, 2.0 and 7.3 m (3 1/2, 1 and 4 fms.) lie about 1/2, 1 1/2, and 2 miles west-southwestward and a 6.7 m (3 3/4 fms.) shoal lies about 1/4 mile southwestward of the islet. Spar buoys mark all except the 7.3 m (4 fm.) shoal.

Raggrund, an area of foul ground on which lies an islet, lies about 1/4 mile eastward of Ledskar and extends about 3/4 mile south-eastward. A 2.1 m (1 1/4 fm.) shoal, marked by a light, lies close northward and a 4.5 m (2 1/2 fm.) shoal close southwestward. A light is shown on Storgrund, a shoal awash about 1/2 mile eastward of the southeastern point of Lemland. Spar buoys are moored on the dangers described with Ledskar and Raggrund according to the uniform system (sec. 1-13).

Numerous islets and dangers extend about 7 miles west-southwestward from Bjorkor to a 3.6 m (2 fm.) shoal with a spar buoy moored over it about 2 1/2 miles south-southeastward of Nyhamn. These dangers also extend about 1 1/2 miles northwestward from Bjorkor to within 1/4 mile southward

of Ledskar. A pair of range beacons stands on islets about $2/3$ mile southward of Ledskar and indicates the fairway rounding the southern end of Raggrund. A pair of range lights is shown from rocks about $7/8$ mile northward and $1\frac{1}{4}$ miles westward of Björkor and lead into the fjord.

Pilotage is compulsory. Pilots can be obtained at Nyhamn and Björkör. The pilot cruising ground for the western approach is about $1\frac{1}{2}$ miles southwestward of Nyhamn.

Directions.—From the Nyhamn pilot station vessels steer 062° with the range lights shown from Långö ahead and when the light shown on Stora Lokskär bears 288° , steer 105° with the light shown on Ledskar ahead. When the lights shown from Långö and the islet close southeastward are in range 307° , steer with this range astern to pass between Ledskar and the dangers southeastward. Thence continue southeastward with the lights on Björkor in range 128° ahead until the range lights about $2/3$ mile southward of Ledskar are intersected, thence round the spar buoy southward of Raggrund to southward and steer into Foglofjard with the lights shown on the rocks northwestward and westward of Björkor in range 217° astern. This fairway is available for vessels of 27-foot draft.

An alternate track for a 29 foot draft, lies between Nyhamn and Ledskar. It is entered about $1\frac{1}{4}$ miles southward of Nyhamn. With range light in line steer 106° for about $3\frac{1}{4}$ miles; pass about 200 yards southward of a 3.3 m (11 ft.) spot marked by a buoy, thence $076\frac{1}{2}^\circ$ for about $1\frac{1}{4}$ miles on a range light thence northeastward for about $3\frac{1}{2}$ miles, marked by range lights astern bearing 224° . On this reach pass close eastward of a 1.8 m (6 ft.) spot, then join the northern route about $1/2$ mile west of Ledskar.

5B-9 Degerby ($60^\circ 02' N.$, $20^\circ 23' E.$), a loading place, is situated on the western side

of the southwestern point of Degerö, a sparsely wooded island about $1/4$ mile northeastward of Flisö and extending about $3\frac{1}{2}$ miles northeastward. Foul ground with several islets extend about $1\frac{1}{2}$ miles northward from the southwestern point of Flisö and also lies from $3/4$ mile off the northwestern end of Flisö to $1\frac{1}{2}$ miles off Degerö. A fairway for 17-foot drafts passes between the foul ground and Degerö and Flisö. An 11-foot draft fairway leads over the foul ground extending northward from Flisö.

A T-shaped custom pier projects from the shore and there is a depth of 6.1 m (20 ft.) alongside the face. Water is available. Anchorage can be taken in 10.9 to 12.8 m (6 to 7 fms.), mud, about $1\frac{1}{4}$ miles southwestward of the customs pier.

Navigational aids.—Spar buoys mark the 11-foot draft fairway on the foul ground extending from Flisö.

Flisoranno Light is shown on the northwestern extremity of Flisö, and Flisoranno Light marking a shoal is shown about 1 mile southwestward of Flisoranno. Brandokobben Light with a radar reflector, marking the southwestern extremity of the island, is located about $3/4$ of a mile west-northwestward of Flisoranno Light.

A light is shown on Rovarör, a rock about $1/2$ mile northwestward of the southwestern point of Degerö, and on the foul ground about 100 yards offshore in the northern part of Degerby.

Range lights and beacons, indicating the fairways, are shown at various parts of the islets and shores of the islands. Spar buoys are moored on the adjacent dangers.

The fairway for 17-foot drafts trends north-northeastward passing westward of Sandö, about $1/2$ mile northward of Degerö, and Nötö, about $1/2$ mile farther northeastward. This fairway joins that for 27-foot drafts between Nyhamn and Turku close

northwestward of Nötö. A light is shown on the western point of Sando.

Bomarsund ($60^{\circ}13' N.$, $20^{\circ}15' E.$) is a loading place about $2\frac{1}{2}$ miles northward of Lumparland, which extends about 6 miles northward from the northeastern point of Lemland. It lies between the southeastern point of the northern part of Åland Island and Prästö, an island close eastward. There is a depth of 14.6 m (8 fms.), mud, in the northern part. Three stone moles project from the shore and have a depth of 3.9 to 4.9 m (13 to 16 ft.) alongside. A church on the shore of Åland Island is a prominent landmark. Provisions and water are obtainable in limited quantities.

A fairway for 21-foot drafts branches from the main fairway between Nyhamn and Turku off the eastern side of Lumparland and leads along the eastern side of the island to Bomarsund. A branch of this fairway for 19-foot drafts trends westward to Rödsko and thence northward to Kastelholm and Godby, loading places in two inlets of Åland Island about 5 and 7 miles westward of Bomarsund. Drafts of 19 feet can reach Kastelholm where there is a depth of 6.1 m (20 ft.), mud. Off Godby a beacon on the western shore marks the anchorage. A ferry cable crosses the fairway, at a depth of 1.5 m (5 ft.) between the western shore and an islet on the southern side of the anchorage; this is lowered for passing vessels.

Lights.—Lights are shown from Långnasudd, the eastern point of Lumparland, Lumparudden, the northern extremity of Lumparland, and Rödsko, a rock about 5 miles westward of the northern point of Lumparland.

A radio mast, marked by lights, stands on the mainland and about 4 miles north-northwest of Lumparudden light.

The above-mentioned fairways, although indicated by range beacons and marked by spar buoys moored on the adjacent dangers according to the uniform system (sec. 1-13), should not be attempted without local assistance.

PILOTS.—A pilot station is located at Långnasudd.

APPROACHES TO MAARIANHAMINA —DANGERS

5B-10 Between Nyhamn and Marhällan, about 5 miles north-northwestward, and thence to Hammarudda, the southwestern end of Åland Island and about $5\frac{1}{4}$ miles farther northwestward, there are many off-lying dangers between which lie the fairways to Maarianhamina for vessels with local knowledge. A fairway for 26-foot drafts trends between the off-lying dangers from Stora Lögskär to the harbor entrance about 6 miles north-northwestward. Another fairway for 24-foot drafts leads about $1\frac{1}{2}$ miles off the southern shore of Åland Island to the harbor entrance. The main approach fairway is available for $29\frac{1}{2}$ -foot drafts and passes on either side of Marhällan and another from Nyhamn passes eastward of Kobbaklintar and joins the other $29\frac{1}{2}$ -foot draft fairways westward of Korso and thence leads about 2 miles north-northeastward to the harbor entrance.

Marhällan (Marhällen) ($60^{\circ}02' N.$, $19^{\circ}52' E.$), a rock, lies about $3\frac{1}{2}$ miles southwestward of the harbor entrance. A light is shown and a fog signal is sounded. Small islet groups lie $\frac{1}{3}$ mile northward and $\frac{2}{3}$ mile northeastward and north-westward; the northwestern group extends about $\frac{1}{2}$ mile northwestward. Lights are shown on the largest islets of the northeastern and northwestern groups.

Kobbaklintar, a group of islets on foul ground about $\frac{1}{2}$ mile in diameter, lies about $\frac{1}{4}$ mile eastward of Marhällan. A pilot station stands on the western islet. A light, used by the pilot boats, is shown at the entrance of the pilot harbor. A fog signal is sounded at the station. A rock lies on foul ground about 200 yards in extent close southwestward of Kobbaklintar.

Korsö, the northwesternmost of a group of islets on foul ground, lies about $\frac{2}{3}$ mile north-northeastward of the northern part of Kobbaklinter. The group lies within about $\frac{3}{4}$ mile eastward through about $1\frac{1}{2}$ miles southward of Korsö. A pair of lights in range 066° is shown and a radiobeacon transmits from the southwestern end of the island. A few islets lie close northward and a rocky area lies about $\frac{1}{2}$ mile north-northwestward of the island.

Skogö, an islet, lies about $\frac{3}{4}$ mile north-westward and has foul ground extending about $\frac{1}{4}$ mile northeastward and $\frac{1}{8}$ mile southeastward from it. A 4.9 m (2 $\frac{3}{4}$ fm.) shoal lies between Skogo and an islet, on which stands a beacon, about $\frac{2}{3}$ mile north-eastward.

Druvan, an islet, with foul ground extending about $\frac{1}{4}$ mile west-northwestward and $\frac{1}{2}$ mile west-southwestward, lies about $\frac{1}{8}$ mile northward of Skogö.

A day beacon is located on Hertronklubb, an islet about $\frac{1}{4}$ mile northward of Korsö.

Spar buoys are moored according to the uniform system (sec. 1-13) on the fairway sides of the dangers.

Granö, with its adjacent dangers, fronts the entrance to Maarianhamina and lies about $\frac{3}{4}$ mile northeastward of Korsö. Granöklubb and Granskär, with foul ground lying close off, lie close northwestward and $\frac{1}{4}$ mile westward of the island. A day beacon is located on the former danger. Foul ground extends about $\frac{1}{3}$ mile southward and a 5.8 m (3 $\frac{1}{4}$ fm.) shoal lies $\frac{1}{4}$ mile northward of Grano. An 8.5 m (4 $\frac{3}{4}$ fm.) shoal lies in the fairway close westward of Granskär. A light is shown on the northeastern extremity of Grano and spar buoys are moored on the fairway sides of the surrounding dangers.

Gottby, a loading place of Maarianhamina, lies in an inlet of Åland Island about 3 $\frac{3}{4}$ miles westward of the harbor. It is about 1 mile in extent and filled with numerous dangers that lie up to 1 $\frac{1}{4}$ miles southward of the entrance. There is a depth of 5.5 m (18 ft.), mud, at the anchorage, about midway

between the entrance points and in the fairway. Two pairs of range beacons at the eastern entrance point and a rock in the middle of the inlet indicate the fairway and the adjacent dangers are marked by spar buoys.

Mockelofjard lies close westward of the western peninsula forming Maarianhamina and affords anchorage in 7 to 7.9 m (23 to 26 ft.), mud, in its entrance.

MAARIANHAMINA (MARIEHAMN)

Position: 60°05'N., 19°56'E.

Depths: Approach fairway, 10 to 50 m (5 $\frac{1}{2}$ to 27 fms.).

Anchorage, 10 to 26 m (5 $\frac{1}{2}$ to 14 fms.).

Harbor, 5.5 to 14.6 m (3 to 8 fms.).

Quays, 2.4 to 5.9 m (8 to 19 $\frac{1}{2}$ ft.).

5B-11 Maarianhamina is a port in a narrow inlet formed by two peninsulas extending southward on the southern side of Åland Island. It is entered about 6 $\frac{1}{2}$ miles northward of Nyhamn.

NAVIGATION

5B-12 From southward at the position about $1\frac{1}{2}$ miles westward of Flötjen (sec. 5-2) a course of 016° for about 14 miles leads to a position close westward of Marhällan where the range lights shown on Korsö are intersected and the directions for entering the harbor should be followed.

From northward, at the southern entrance to Södra Kvarnen (sec. 5-2), a course of 109° for about 25 miles leads to a position westward of Marhällan where the range lights shown on Korsö are intersected.

These courses lead over depths greater than 73 m (40 fms.) and their nearest approach to any danger is at the arrival position.

NAVIGATION SEASON

5B-13 Maarianhamina is ice-free except in the coldest winters and at that time the harbor is kept open by ice breaker.

DEPTHS

5B-14 A draft of 29½ feet can be carried to 1¼ miles within the harbor entrance and thence a fairway for 24-foot drafts leads to the northern end of the quays. There are general depths of 3 to 12 fathoms in the western harbor and 10 to 20 feet in the eastern harbor. The quays in the western harbor have depths of 8 to 19½ feet alongside (1957), and the berth of the eastern harbor has 11¾ feet alongside.

ASPECT—LANDMARKS

5B-15 Maarianhamina is completely hidden from seaward by the heavily wooded hills in the vicinity. In addition the lights mentioned in the approaches to the harbor, a lookout tower and an aviation light close northward of the inlet are useful landmarks. The church in Jomala, about 3½ miles northward of Maarianhamina, can be seen a great distance seaward.

HARBOR

5B-16 The port of Maarianhamina consists of a western and eastern harbor lying on either side of a narrow peninsula extending about 3½ miles southward from Åland Island. The western harbor, an inlet with a river flowing into its head, is available for ocean-going vessels. It is about 300 to 600 yards wide between Lotsberget, a hill 138 feet high directly south of Maarianhamina, and Svinö, an islet close southward, and the peninsula of Möckelö and Langnässkärr an island close southward. The head of the inlet, the eastern shore in the vicinity of Svinö, and the western shore is foul. Spar buoys mark the outer edges of the foul ground adjacent to the fairways and in the harbor.

Slemmern is a bight on the eastern side of the peninsula where the berths of the eastern harbor are located. A fairway for 12-foot drafts leads to the berths from Rödhamn, and another for 10-foot drafts leads from the

Lemströmin Kanava, a canal through the isthmus connecting Lemland with Åland Island and about 2 miles eastward.

Navigational aids.—A pair of lights in range 027½° is shown at the southern part of the town and indicate the fairway entering the western harbor.

A light is shown from the pilot landing close southward of the quays.

A pair of range beacons stands on Langnässkar and another stands on Svinö. Two beacons stand on Svinö and form two ranges with beacons standing on Druvan and Granöklubb. These beacons indicate the 24-foot draft fairway approaching from westward and passing northward of the dangers in the approach.

Submarine cables (sec. 1-34) are laid between the Swedish coast and Åland Island. These cables are landed in the vicinity of Möckelö and lie in the approach fairways. A cable crosses the western harbor of Maarianhamina about ¾ mile from the river mouth and a second crosses about ½ mile further south.

Anchorage can be taken about ½ mile northeastward of Skogö in 9½ to 16 fathoms, mud and stones. The harbor provides well-sheltered anchorage due to the numerous off-lying islands, and vessels, prevented from proceeding into the Gulf of Bothnia by ice, use it as a harbor of refuge. Vessels may obtain anchorage westward of the pilot station of the town in 6 to 10 fathoms, mud and sand, and in Slemmern in 3 fathoms, mud.

PILOTS

5B-17 Pilotage is compulsory. Nyhamn, and Björkor can furnish pilots for vessels bound through the inner fairways. Kobaklinter is the pilot station for vessels entering through the main approach fairway and there is a pilot station in the southern part of the town for outbound vessels.

DIRECTIONS FOR ENTERING

5B-18 Vessels entering Maarianhamina through the main approach fairway should steer 066° with the lights on Korsö in range. When the light shown on the islet about $\frac{2}{3}$ mile northeastward of Marhällan bears 336° the range lights shown from the southern part of the town are intersected and a course of 027½° should be steered with these lights ahead. This course skirts the foul ground extending southward from Langnässkär. The spar buoy moored at the southern end of this foul ground should be given a good berth until the light shown from the pilot station southward of the quays bears 004°. Thence a course should be steered with that light ahead and the light shown on Granö astern, passing between the spar buoys moored on the channelward sides of shoals extending from the shore and into the harbor entrance.

FACILITIES

5B-19 Maarianhamina, with a population of about 3,600 in 1950, in the largest town of the Åland Islands. It is the distributing port of the islands. Wood products, timber, butter, meat, and fish are exported; coal and consumer goods are imported.

Berths.—There is a total quayage of about 1,600 feet along the eastern side of the western harbor with depths of 9½ to 19½ feet alongside. A few yards off the quays the depths are 3 to 6½ feet greater.

West Harbor oil pier lies on the eastern side of the channel about ½ mile southward of the town and has a depth of 21 feet alongside. Only small coasters and fishing vessels can be bunkered at this facility.

In the eastern harbor there is a 130-foot pier with depths of 7¾ to 11¾ feet alongside.

There are no lighters, rail connections, or discharging facilities servicing the berths. One tug is available.

Supplies.—Provisions can be obtained in limited quantities. Fuel oil is available to small coasters and fishing vessels. Fresh water is supplied at the quays. Granite is available for ballast.

Repairs.—Repairs of a minor nature can be accomplished. There is a shipyard with a small marine railway.

Communications.—Regular service is maintained between Helsinki, Stockholm, and Turku by coastal steamers and an airline. Telephone and telegraph connection exists between Maarianhamina and the Finnish and Swedish coasts. There are good roads on Åland Island. A radio station is located northward of the town.

Medical.—A hospital in the town will receive seamen.

ANCHORAGES

5B-20 Utö—In 3½ to 5 fathoms, sand, for small vessels between Utö and the smaller islets about ⅓ mile northward. There are mooring rings on these islets.

Föglöfjärd.—In 9 to 12 fathoms, mud, on the western side of the fjord about 1¼ miles northeastward of Storgrund Light. In 15 fathoms, mud and stones, during the summer, with a beacon on Ledskär bearing 273° and a beacon on Björkör bearing 183°.

Rödhamn.—In 8 fathoms, mud, for small vessels with 18-foot drafts, between the islets close northeastward of Längö.

Maarianhamina.—See section 5B-16.

Part C. WESTERN SIDE OF ÅLAND ISLANDS

5C-1 Hammarudda (60°05' N., 19°46' E.) is the southwestern extremity of Åland Island and the western entrance point of Gottby (sec. 5B-10), one of the loading places of Maarianhamina. A submarine cable (sec. 1-34) from the Swedish coast lands here.

GENERAL

5C-2 Between Hammarudda and the islet of Sälkä, 19½ miles north-northwestward, the Åland Islands extend westward about 12 miles to their outermost rock, Yttre Borgen. Eckerö, the largest island of this group, is separated from Åland Island by Marsund, a narrow strait. Within this western area, which has a perimeter of about 40 miles, are disposed numerous islands, rocks, and reefs between which are a number of navigable channels. The dangers which lie westward of Yttre Borgen and on the eastern side of Södra Kvarken are described in section 6B-5.

DEPTHS—DANGERS

5C-3 The depths closely bordering the perimeter of the western Åland Islands and their contiguous dangers vary greatly but in general are from 5 to 100 fathoms.

The southwesternmost danger is the islet of *Gisslan* which is marked by a light and close southwestward by a spar buoy and is situated 14 miles west-northwestward of *Hammarudda*. It is surrounded by shallow water for a distance of 700 yards.

Yttre Borgen, a rock closely surrounded by shallow water, is the westernmost danger and lies $6\frac{1}{2}$ miles north-northwestward of *Gisslan*. An 8.2 m (4 $\frac{1}{2}$ fm.) lies about 1 $\frac{1}{4}$ miles northwestward of the rock.

On the northwestern side of the *Aland Islands*, the outermost dangers are *Sydbrotten*, with a depth of 0.6 m (2 ft.), situated 6 miles north-northeastward of *Yttre Borgen*, and *Märkallarna*, two rocks, located $4\frac{3}{4}$ miles farther north-northeastward.

The dangers farther westward and north-westward are described in section 6B-5.

NAVIGATION

5C-4 Offshore tracks are described in sections 5-2 and 5B-3.

The directions for navigating *Södra Kvarken* are given in section 6B-6.

Navigation within the perimeter of the western *Åland Islands* should not be attempted without local assistance.

FEATURES

5C-5 *Marsund*, the narrow channel between the islands of *Åland* and *Eckerö*, is navigable by craft not exceeding a draft of 7 feet. The channel is entered from southward at a position close westward of *Hammarudda*, or at a position off the southern end of *Eckerö*, 5 miles northwestward. A lifeboat is maintained on *Eckerö*. The channel is entered from northward on the eastern side of the island of *Finbo*.

Eckeröfjärd ($60^{\circ}10' N.$, $19^{\circ}30' E.$) indents the southern side of *Eckerö* and will accommodate vessels up to 26 feet of draft. There is an anchorage about 400 yards in diameter in

10.9 m (6 fms.) just northward of *Torpo*, an island on the western side of the entrance. The inlet is entered similarly to *Marsund*.

Storby, on the western side of *Eckero*, stands on the eastern shore of a bay, 1 $\frac{1}{2}$ miles wide. A draft of 26 feet can be carried in the approach to an anchorage off the village where a large vessel can anchor in 10 m (5 $\frac{1}{2}$ fms.). A light is shown on request about $\frac{3}{4}$ mile northward of the village. There is a customhouse, and a postal and telegraph office.

Signilskar ($60^{\circ}12' N.$, $19^{\circ}20' E.$), the largest island of the westernmost group of *Aland Islands*, is situated 2 $\frac{1}{2}$ miles northeastward of *Gisslan* (sec. 5C-3). It is separated from *Enskar*, close northwestward, by a narrow 16-foot buoyed channel where small ships can find a sheltered anchorage.

A light is shown on the northwestern extremity of *Signilskär*, and another light is shown on the southeastern end of *Enskär*.

A light is shown on an islet 5 miles east-northeastward of *Gisslan*.

Submarine cables are laid between *Enskär* and the western side of *Eckerö* about 1 mile southward of *Storby*.

A lifesaving station with a line-throwing apparatus is located on *Signilskär*.

Finbofjärd, a deep-water bay about 2 miles in diameter, lies between the island of *Finbo*, close northward of *Eckerö*, on its western side and a group of islands on its eastern side. The bay affords anchorage for large vessels in 16.4 to 29 m (9 to 16 fms.). *Finbofjärd* and *Marsund* are entered from northward through a buoyed channel eastward of *Salskar* (sec. 5D-1).

ANCHORAGES

5C-6 *Eckeröfjärd*.—See section 5C-5.

Storby.—See section 5C-5.

Signilskär.—See section 5C-5.

Finbofjärd.—See section 5C-5.

Part D. NORTHERN SIDE OF ÅLAND ISLANDS TO FINNISH COAST

5D-1 Sälskär ($60^{\circ}25' N.$, $19^{\circ}36' E.$), the southernmost and largest of a group of islets, lies $2\frac{1}{2}$ miles northward of Finbo (sec. 5C-5). The islets stand on a shallow patch surrounded by other detached patches; the easternmost patch is marked by a spar buoy which is moored on the western side of the channel leading to Finbofjärd and Marsund.

A light is shown from the western side of Sälskär.

GENERAL

5D-2 The northern end of Åland Island and the eastern side of Eckerö are sufficiently high so as to be visible from a considerable distance. The area southeastward of a line joining Sälskär and Enskär (sec. 8A-1), 46 miles northeastward, is occupied by myriad islets, rocks, and reefs between which are several tortuous but navigable channels. Several isolated dangers lie up to $4\frac{3}{4}$ miles northwestward of the line previously mentioned but, since their positions have not been determined accurately, mariners are cautioned not to approach them without local assistance.

Enskär lies about 10 miles off the mainland coast of Finland which here is profusely indented and fronted with hundreds of islets, rocks and reefs.

DEPTHS—DANGERS

5D-3 Depths.—With the exception of the shallow patches described below, the depths close northwestward of a line joining Sälskär and Enskär vary from 10.9 to 48 m (6 to 26 fms.).

Dangers.—Only those dangers lying northwestward of the before-mentioned line will be described below.

Dangers lie within a distance of $1\frac{1}{4}$ miles northwestward and northeastward of Salskar Lighthouse.

Tartarus, with a least depth of 3.9 m (13 ft.)

and marked by a spar buoy, lies $4\frac{1}{2}$ miles north-northwestward of Salskar Lighthouse. It is bordered for $1\frac{1}{4}$ miles southward and westward by other patches with a least depth of 5.2 m (17 ft.).

Kallan, the northernmost islet of those bordering the northern end of Åland Island, is fronted for a distance of 3 miles with dangers. A fishing light is occasionally shown on the islet. Yttre Margrund and Inre Margrund, each with a depth of 0.6 m (2 ft.) and each marked by a spar buoy, lie about $1\frac{1}{2}$ miles southeastward of the outermost above-water rocks.

Jarngrynnorna, with a depth of 3.6 m (12 ft.) and marked by spar buoys on its north and south sides, is located 8 miles north-northeastward of Kallan. A light buoy is moored about one mile north-northwestward of Jarngrynnorna. Several dangers, some marked by buoys, are disposed between Jarngrynnorna and Åland to southward.

Petterssonsgrund lies in the approach to Uusikaupunki in a position $9\frac{1}{2}$ miles west-southwestward of Enskär and is described in section 8A-3.

NAVIGATION

5D-4 Since the positions of the dangers off the northern side of the Åland Islands have not been determined accurately, they should not be approached without local assistance southward of a line drawn parallel to and 5 miles northward of the line joining Sälskär and Enskär.

FEATURES

5D-5 Northern channels to Bomarsund (sec. 5B-9).—The northern approach to this channel lies westward of Koksna ($60^{\circ}28' N.$, $19^{\circ}57' E.$), an islet lying 6 miles east-northeastward of Kallan. Thence the channel trends southeastward, passing between a spar buoy marking the extremity of the shoal water extending southwestward from Koksna and the buoy marking Fjärdgrynnan, a 4.9 m (16 ft.) shoal about $1\frac{1}{2}$ miles southwestward of Koksna.

An approach channel from westward leads eastward of Yttre Märgrund and Inre Märgrund. Thence it leads northward of Åland, passing between two buoys about 1 mile eastward of Kallan and northward of two buoys marking the extremities of dangers close northward of Åland. The channel, trending east-southeastward, passes about $\frac{3}{4}$ mile southward of Fjärdgrynnan and joins the above channel about 3 miles southeastward of that shoal.

The channel which can be used by vessels drawing 18 feet extends 15 miles southeastward to Bergökubb and passes between Hundkubb, a pilot station, and off-lying islands, some of which are Saggö, Boxö, and Sommarö. From Bergökubb the channel continues southward for about 5 miles to Bomarsund. About 2 miles northward of Bomarsund the channel divides. That part leading southward will accommodate vessels of 14-foot draft; the other leading southeastward and between Prästö and Töftö will take vessels of 18-foot draft.

Navigational aids.—Spar buoys mark the dangers on both sides of these channels. A light, shown only when required, is located on Koksnan.

Pilots may be obtained about 1 mile northwestward of Koksnan.

ANCHORAGES

5D-6 Small vessels can anchor close southward of the island of Dånö Gamla, $21\frac{1}{2}$ miles southward of Kallan, and off the southern side of Saggö, 2 miles northeastward of Hundkubb.

Vessels using the northern channel to Bomarsund can anchor in the roadstead midway between Hundkubb and Boxö where there are depths of from about 11 feet to 14 fathoms.

Part E. TURKU AND APPROACHES

5E-1 **Turku** ($60^{\circ}27' N.$, $22^{\circ}14' E.$), situated on the southwestern coast of Finland, has a well sheltered and important harbor, described in section 5E-18, through which

passes the principal agricultural exports and imports of Finland and is also the center for the import of fuel oil. The outer anchorage can be reached by vessels with a draft of 33 feet, and vessels with drafts of from 20 to 27 feet can berth at the principal wharves. Vessels with a draft of $29\frac{1}{2}$ feet can berth at the oil terminal westward of Turku.

The harbor is reached from seaward by four well-marked channels through the Turku Archipelago. Each channel is entered as hereinafter indicated followed by its position, distance to Turku, and depth of water in the channel: ships from the Baltic Sea make for Uto in $59^{\circ}47' N.$, $21^{\circ}22' E.$, 52 miles, 33 feet; ships from Alanda Hav make for Nyhamn in $59^{\circ}58' N.$, $19^{\circ}57' E.$, 87 miles, 27 feet; ships from the Gulf of Bothnia make for Enskär in $60^{\circ}43' N.$, $21^{\circ}01' E.$, 61 miles, 29 feet; and ships from the Gulf of Finland make for Hanko in $59^{\circ}49' N.$, $22^{\circ}58' E.$, 61 miles, 24 feet.

HANKO TO TURKU

5E-2 Pilot stations on this route are Hanko Station on Tulludden, Jungfrusund Station on Högsåra ($59^{\circ}57' N.$, $22^{\circ}22' E.$), Paraistenportti Station on Timmerholm ($60^{\circ}11' N.$, $22^{\circ}16' E.$) and Turku Station at Pikisaari at the southern entrance of the harbor.

The channel for vessels with a draft of 24 feet, marked by lights, beacons, and buoys, leads via Jungfrusund, Pensar, and Airisto Erstan; there is also a marked channel via Jungfrusund and Paraistenportti for vessels with a draft of 20 feet.

5E-3 **Hanko to Högländ.**—This channel is entered from southeastward in common with that for Hanko and which is described in section 3A-5. The track passes northward of Tullholm and southward of Kistskäer, mentioned in section 3A-11. The track then trends northwestward around Utterklint and thence north-northeastward passing northward of Lill Klippen Light Beacon, and thence northwestward, passing southward of Fläckgrund. Fläckgrund is marked by a light.

The channel from a position $4\frac{1}{2}$ miles northwestward of Fläckgrund is indicated by Galtarna and Lill Angeso Light Beacons in range 286° ; it thence passes northward of Galtarna Light Beacon ($59^\circ 55' N.$, $22^\circ 37' E.$), thence between Idskär and Idskärskubb Light Beacons, $2\frac{1}{4}$ miles westward of Galtarna, thence southward of Järngrund Light Beacon, $2\frac{1}{2}$ miles southwestward, and thence northward of Fungskär Lighthouse, 1 mile westward of Järngrund. The channel thence trends northwestward into Jungfrusund, passing eastward of Pervetskär Light Beacon and Onholm Lighthouse; the first reach in Jungfrusund is marked by the range of Fungskär Lighthouse and a light beacon 300 yards southeastward bearing 148° - 328° . From Onholm the channel continues northward to Jungfruholm, on the eastern side of the channel at the northern end of Jungfrusund, passing westward of Kuggör light structure.

Anchorage in Jungfrusund.—Large vessels can anchor in the sound in 14 to 16 fathoms either $\frac{3}{4}$ mile north-northeastward of or $1\frac{1}{4}$ miles northward of Onholm Lighthouse. Small vessels can anchor in coves on the eastern sides of Högsåra and Närmärö, close northward.

5E-4 Channel to Dalsbruk (Taalintehdas) ($60^\circ 01' N.$, $22^\circ 30' E.$).—A channel to Dalsbruk for vessels of 20-foot draft branches northward from the main track at a position $\frac{3}{4}$ mile eastward of Idskär. This channel leads also to Bruksfjärd, $1\frac{1}{2}$ miles eastward of Dalsbruk, where there is a wharf with an alongside depth of 20 feet.

5E-5 Hanko to Högländ, continued.—The channel continues northward from Jungfruholm between two islands, Hamnholm and Sandskär, on the western side, the eastern point of each being marked by a beacon, and the high land of Högländ, on the eastern side, where a peninsula $\frac{1}{2}$ mile south-southeastward of Sandskär is marked by the front Ekholm lighted range beacon. From Sandskär the channel trends north-northwest-

ward about $1\frac{1}{2}$ miles to a buoyed fairway leading between a number of islets and dangers. A light is shown from an island about 3 miles north-northwestward of Sandskär. The light beacon on Ekholm in range $160\frac{1}{2}^\circ$ astern with another light beacon about $\frac{3}{4}$ mile south-southeastward leads to the channel, and two beacons, one of which is lighted, in range 327° on the island of Högländ, about $1\frac{1}{4}$ miles northwestward of the fairway entrance, lead through the fairway. When $\frac{1}{2}$ mile distant from Högländ the track turns northward and passes eastward of this island.

Two submarine cables are laid from the vicinity of Ekholm front light beacon to Helsingholm, situated about $5\frac{1}{4}$ miles southwestward.

5E-6 Högländ to Turku via Pensar.—From abreast the light beacon on Högländ ($60^\circ 06' N.$, $22^\circ 19' E.$) the track leads northward between two buoys and thence turns sharply westward. The westward trend of this track leads about $3\frac{1}{2}$ miles to close northward of Trollholm and is indicated by a beacon on Viggskär and on Ekholm, two islets about $1\frac{1}{2}$ miles eastward of Högländ, in range 091° astern. It passes between the dangers off Vitharu, an islet about 2 miles westward of Högländ, and those off Skjutskär, about $\frac{2}{3}$ mile northward. From a position northward of the buoy moored northward of Trollholm the track turns slightly northward and thence trends northwestward toward Pensar. The latter stretch is indicated by the beacon on Trollholm in range 141° astern with the beacon on Norrland, about $\frac{2}{3}$ mile southeastward.

Five pairs of range beacons indicate the channel eastward of Pensar to a position $\frac{1}{2}$ mile northwestward of Svartholm ($60^\circ 11' N.$, $22^\circ 11' E.$). The first pair on Hallonholm, situated nearly $\frac{1}{2}$ mile northeastward of the northeastern end of Pensar, in range bear 005° ; the second pair on Nagu-Sandö in range bear 345° ; the third pair on Linholm in range bear 051° ; the fourth pair situated on islets southwestward of Svartholm light

structure in range bear 031°; and the fifth pair on Halsholm in range astern bear 194°.

From the position $\frac{1}{2}$ mile northwestward of Svartholm the track leads $\frac{1}{4}$ mile northwestward on the range astern of the light beacons on Heisala bearing 309° to and along the south side of Bässholm; thence westward of Bässholm and Rödgrund. Lights are shown on the southwestern side of Bässholm and on a rock about $\frac{3}{4}$ mile eastward of Bässholm. A light is shown on the southern side of the fairway about $\frac{1}{4}$ mile south-southeastward of Bässholm Light.

From westward of Rödgrund the track leads northward between Stor Melö, on the eastern side, and Haverö, on the western side. The western point of Stor Melö is marked by a light; a spar buoy marks the edge of the shore bank at the point. The track then passes eastward of the Linsör Islets and westward of Grangrund into the road of Airisto where it joins the main track from Utö and Nyhamn. A light is shown from an islet about $\frac{3}{4}$ mile northeastward of the northern of the Linsör Islets.

The outer anchorage of Turku is entered from Airisto on the track leading eastward of Rajakari (Notgrund) (60°23' N., 22°06' E.), situated $7\frac{1}{2}$ miles northward of Stor Melö.

5E-7 Högland to Turku via Paraistenportti.—This channel, which is extremely narrow in part and about $1\frac{1}{4}$ miles shorter than the one via Pensar, is available for vessels of 20 feet of draft.

From a position between the two buoys northward of Högland (sec. 5E-6) the track leads northwestward with two beacons, one on the southeastern side of Sorpo and the other on an islet lying close off it, in range 315°. The southern entrance of the narrow channel eastward of Sorpo is marked by the front range beacon just mentioned, on its western side, and the Långholm Beacon and Buoy, on its eastern side. From its southern entrance the channel extends 3 miles north-

ward to Attu Light Beacon (60°11' N., 22°18' E.), on its eastern side, and an islet marked by two cairns, on its western side. The narrowest part of the channel which is buoyed is at Paraistenportti, at about midlength. Godaholm, a small islet on the western side of the channel, is marked by a light beacon.

From the northern end of the narrow channel the track leads westward $2\frac{1}{2}$ miles with the white sector of Attu Light astern bearing between 095° and 097° to and along the Heisala Range, eastward of Svartholm, where it joins the Pensar track described in section 5E-6, which see for description therefrom to Turku.

There is a pilot station on the island of Timmerholm just northward of the track and about 1 mile westward of Attu Light Beacon.

Channel to Pargas (Parainen) (60°17' N., 22°18' E.).—A channel for 24-foot drafts leads northward about 7 miles from about $\frac{1}{3}$ mile westward of Attu Light Beacon to the loading place of Pargas. This channel, although very narrow, is well marked with range lights and spar buoys.

UTÖ TO TURKU

5E-8 Pilot stations on this route are Utö Station (sec. 5B-1), Killingholm Station (60°07' N., 21°41' E.), and Turku Station at Pikissaari at the southern entrance to the harbor.

This channel for vessels with a draft of 33 feet is marked by lights, beacons, and $29\frac{1}{2}$ feet is marked by lights, beacons, and buoys and leads via Killingholm, Lövskär, and Airisto.

5E-9 Utö to Lövskär.—The directions for entering the channel from Utö are given in section 5B-5.

From a position north-northeastward of Svartgrund a track for 33-foot drafts trends north-northeastward passing westward of Bokullankivi light and a 1.7 m (5 ft.) shoal marked on its Western side by a spar buoy, thence east-northeast with Norparskarsten and Grisselharu lights in range. Pass westward of Norparskarsten steering on Noto

lighted range, thence with lighted beacons on Rodharun and Skogsfliisan in range, pass about 400 yards eastward of Flatokubb light (59°56'N., 21°39'E.); this course will pass close eastward of a 2.4 m (1 1/4 fm.) shoal marked by a spar buoy, about 7/8 of a mile north-northeastward of Flatokubb light. With Trutklapp and Djupklapp lights in range astern bearing 179 1/2°, pass between the lights on Bondskar to the West and Bondsten to the east, thence with the lights on Grisselborg and Verkhölm in range 345° and keeping the white sector of Bondsten light astern, pass westward of Lang Ljusskar light thence with Fagerholm lights in range 007°, steer for them on that bearing passing eastward of Grisselborg and Kalvholm and westward of some shoals marked by spar buoys, thence between Fagerholm and the two spar buoys marking an 8.2 m (4 1/2 fm.) shoal and the edge of the shore bank extending westward from Snackholm, on the eastern side, and Killingholm and Rodskar, on the western side. Lights are shown from Rodskar and Tärngrund, the latter an islet close offshore the northwestern extremity of Killingholm.

Numerous submarine cables are laid between the islands in this area.

There is a pilot station at Killingholm.

From westward of Snackholm the track continues north-northeastward, passing eastward of Rodbada and Tallholm, westward of Vandrock, to a position westward of Lövsjär, where the track joins the main one from Nyhamn. The light on Tärngrund in range 194° astern with a light about 1/2 mile to the south-southwest leads over the lower portions of this track while light beacons on Rödbåda and Tullholm in range 007° lead over the latter.

Kopphäll Light is shown from a small islet on the western side of the channel about 1 mile northward of Tärngrund. Hols-

tanäs Light is located on the western side of the channel about 1 3/4 miles north-northeastward of Kopphäll Light. A light is located on Strandbyhäll, an island about 1 1/4 miles north-northwestward of Holstanäs. A light is shown on Stora Onskär, an island nearly 1/2 mile south-southwestward of Rödbåda. A light is shown on the eastern side of an island about 2/3 mile north-northwestward of Tallholm. A beacon is located on the northern side of Vandrock, an island about 3/4 mile northeastward of Rödbåda.

5E-10 Anchorages.—Vessels can anchor in about 29 m (16 fm.) in a position 1/2 mile northeastward of Svartgrund Light Beacon and 1/4 mile westward of a spar buoy marking the western edge of a shoal patch.

Anchorage in from 9.1 to 18.3 m (5 to 10 fms.) can be obtained about 400 yards off the southeastern side of Vidskar; beyond this the depths increase rapidly. Vessels can anchor in greater depths about 1/4 mile south-southeastward of the southern point of this island.

Vessels can anchor in about 24 m (13 fms.) 600 yards north-northwestward of Ingolskar.

There is an anchorage berth in about 12.8 m (7 fms.) about 1/4 mile northeastward of the northeastern point of Aspo with Ingolskar bearing 290°.

Small craft can anchor in about 18.3 m (10 fms.) 800 yards northward of Fagerholm Light Beacon with Tärngrund Light Beacon bearing 235°; also in from 7.3 to 12.8 m (4 to 7 fms.) close off the southeastern side of Killingholm.

Small craft can also anchor in an inlet on the western side of Nagu, 2 miles south-southeastward of Rodbada, in from 10.9 to 20.1 m (6 to 11 fms.) or in 10.9 m (6 fms.) in an inlet on the northwestern side of the same island.

sund described in section 5E-6, which see for description therefrom to Turku.

Small craft can anchor in 10.9 to 21.9 m (6 to 12 fms.) in an inlet northward of Krampholm situated 1 1/2 miles northward of Orhisaari Light Beacon.

NYHAMN TO TURKU

5E-12 Pilot stations on this route are Nyhamn Station (sec. 5B-7), Salso Station (60°05'N., 20°45'E.) near Rodgrund, Rovskar Station (60°09'N., 21°20'E.) near Rodskar, and Turku Station at Pikisaari at the southern entrance to the harbor.

This channel for vessels with a draft of 27 feet is marked by lights, beacons, and buoys and leads northward via Föglöfjärd, thence eastward via Sälso, Rödsjär, Lövsjär, and Airisto.

5E-13 Nyhamn to Sälso.—The directions for entering this channel from Nyhamn to the southern part of Föglöfjärd are given in section 5B-8.

From a position in the southern part of Föglöfjärd on the range of the Asksjär Beacons, the track leads northeastward, passing westward of the light shown on Regrund, to and along the range of the light beacons on Skötsjär and Kalgrund bearing 026½°, passing between several shoal patches marked by light buoys and spar buoys. Lighted beacons situated on Järsö and Staholm in range 000° lead between shoals marked by spar buoys; thence the track turns northwestward on the range of beacons, one lighted, bearing 323°, situated on Enskär, to and along the range astern of the Finngrund Light Beacons bearing 193 1/2° through Jarsostrommen. After passing westward of Gottholmsklubb Light Beacon the track turns northeastward with the light beacon on Stockgrund (60°07'N., 20°21'E.), about 1¼ miles north-northeastward of Gottholmsklubb, bearing 037° with a beacon on Björkö deadastern. The track then turns eastward, passing southward of Stockgrund and northward of the spar buoys marking the shore bank northward of Stor Gottholm.

From northward of Stor Gottholm the track turns southeastward for 3 miles on the range of two beacons, one lighted, bearing 112°, situated on the northwestern side of Nötö. Close off Nötö the track is joined by that from Degerby (sec. 5B-9) and turns sharply northward, passing between Skarpskar (60°07'N., 20°28'E.) and a spar buoy; thence with the light beacons on Skarpskar in range 263° astern, the track leads northward of the beacon on Långholm, thence between shoals marked by spar buoys, passing northward of Enskär which is marked by a light beacon. From northward of Enskär the track trends southeastward and passes southward of Sänökubb, an islet marked with a beacon, and Hamnör, which has a light beacon, thence northward of the light beacon on Ljungö and that on Rödsgrund. An alternative track, passing westward and southward of Rödsgrund, approaches closer to Sälso, where there is a pilot station.

5E-14 Sälso to Turku.—From northward of Rödsgrund the track continues southeastward and passes northward of the light beacon on Husö (60°05'N., 20°49'E.) to and along the range astern of the light beacons on Husö and Sälso bearing 266½°; this reach is 9 miles long and passes northward of Bogskär, southward of Rödaön, and northward of Kihti. These three positions are each marked by a light beacon. The track from Husö to Bogskär passes between spar buoys marking shoals. Falkarna Light, situated on a shoal with a depth of less than 1.8 m (6 ft.) in a position 3/4 mile east-northeastward of Husö Beacon is fitted with a radar reflector.

The track from a position northward of Kihti, trends east-northeastward and passes southeastward of Skalgrund Light, northward of Rodskar Light Beacon, southeastward of Rövsjär Pilot Station, and northward of Smorgrund Light Beacon (60°11'N., 21°27'E.). From northward of Smorgrund the track trends northeastward, passing close northward of Keitsoorinkivi Beacon, which is lighted and fitted with a radar reflector, thence southward of Kokombrink Light Beacon. About ½ mile east-northeastward of

this latter beacon a buoyed track, part of which is indicated by a pair of lighted range beacons, leads south-southeastward for about $1\frac{1}{2}$ miles to Galtby. About $2\frac{3}{4}$ miles east-northeastward of Kokombrink Light Beacon a buoyed channel, indicated by a pair of lighted range beacons on the island of Havträsk, leads northward from the main track to within about 100 yards of a pier at Ankis; there is a depth of about 4.2 m (14 ft.) near the pier. The main track continues eastward to Lovskar where it joins the track from Uto (sec. 5E-11).

Bomarsund to Turku.—The northern route, marked by beacons and buoys, may be used by vessels of 10-foot draft. A pilot station is situated at Prästö, close eastward of Bomarsund (sec. 5B-9).

The track passes northward of Prästö and Töftö, the latter having two beacons on its northern point; thence it trends southeastward between Ballerö, with two beacons on its eastern side, and the southern tip of Vårdö. A light is shown on the northern extremity of Ballerö. The track trends northeastward along the southeastern side of Vårdö, passing westward of Svartholm and Österholm; thence between Skälklubb and Loö, where it trends eastward and passes between Mellanklubb and Gåsskär, an island about 800 yards northward of Mellanklubb. A 3 m ($1\frac{3}{4}$ fm.) patch lies close southward and a 3.9 m ($2\frac{1}{4}$ fm.) patch lies close northward of the track about $\frac{3}{4}$ mile westward of Mellanklubb. Both dangers are marked by spar buoys.

From westward of Svartholm to Skälklubb, the fairway is indicated by a series of range beacons, but local knowledge is essential. A light is shown on Skälklubb and on Mellanklubb; a beacon stands about in the center of the latter island and a beacon stands on the northeast end of Skälklubb. Skälklubb Light in range 258° with a beacon on Vårdö indicates the fairway from Skälklubb to Mellanklubb, passing midway between the 3 and 3.9 m ($1\frac{3}{4}$ and $2\frac{1}{4}$ fm.) patches previously mentioned.

After passing between Mellanklubb and Gasskar, the track trends northeastward and passes close northward of Baro. A light is shown on the western extremity of Baro,

there is a beacon close southward of the light structure ($60^\circ 18' N.$, $20^\circ 44' E.$).

The fairway, indicated by the Killing-skär—Slatekär Range Lights, both shown from rectangular daymarks, trends southeastward along the northeastern side of Kumlinge and passes northward of Kolskär. Kolskär Light ($60^\circ 16' N.$, $20^\circ 54' E.$) is shown at the northern end of the islet of that name. Thence the track leads between Gunnarskären and Långbrok (Longbrok), thence eastward, passing northward of Snöbådan, southward of Rangskär and northward of Svinö; thence southeastward, passing northeastward of Grötgrund and Bergskär; thence eastward, passing between Kivimo and Houtskär; thence westward and southward of Saverkeit, on the southeastern side of which are a pair of beacons in range about 302° , astern, leading to the main channel from Sölsö to Turku southward of Kokombrink.

A light is shown on Snöbådan about $5\frac{1}{2}$ miles east-southeastward of Kolskär Light structure, and Rangskär Light is shown on the islet of that name about $3\frac{1}{2}$ miles farther eastward.

A shoal with a least depth of 3.9 m ($2\frac{1}{4}$ fms.) exists about $\frac{1}{4}$ mile west-northwestward of Snobaden. Another shoal with a least depth of 5.8 m ($3\frac{1}{4}$ fms.) exists about $\frac{3}{8}$ mile southwestward of Snobaden. Both dangers are marked by spar buoys.

Allorgrynnan Beacon is situated about $\frac{3}{4}$ mile northward of Snöbådan.

A beacon ($60^\circ 15' N.$, $21^\circ 14' E.$) marks the northern extremity of Svinö, another stands on Rostmansskär, about 600 yards northward, and a third is located on the southern side of an islet close southwestward of Rostmansskär.

Grötgrund Light is shown about $1\frac{1}{4}$ miles southeastward of Rangskär; Bergskär, about $\frac{1}{2}$ mile farther southeastward, is marked by a beacon.

The Halmansten—Sandskär Lights, in range 118° – 298° , are shown about $2\frac{1}{2}$ miles southwestward of Grötgrund Light structure.

ENSKÄR TO TURKU

5E-15 Pilot stations on this route are Enskär Station (sec. 8A-1), Heponiemi Station and Turku Station at Pikisaari at the southern entrance to the harbor.

The channel for vessels with a draft of 29 feet is marked by lights, beacons, and buoys and leads via Lypertö, Kalsor ($60^{\circ} 18' N.$, $21^{\circ} 44' E.$), Lövskär, and Airisto.

5E-16 Enskär to Laupunen.—The directions for approaching Enskär are given in section 8A-5.

From a position about $\frac{1}{2}$ mile southward of Enskär Lighthouse, the track leads south-eastward, passing northward of Medelklubb Light Beacon, located 2 miles southeastward, thence southward to and along the range of Kokinluoto Lighted Beacons ($60^{\circ} 39' N.$, $21^{\circ} 13' E.$) bearing $124\frac{1}{2}^{\circ}$, passing between several shoals marked by spar buoys. Two lighted beacons situated on the islets of Pohkari and Eckerholm on the western side of the channel off Lypertö in range bearing $153\frac{1}{2}$ indicate the track southeastward from the Kokinluoto Range.

The track from the range at Lypertö, which passes northeastward of the light beacon on Mustaklupu and between several spar buoys, enters a narrow strait which extends 10 miles southeastward from Kattkuru, $1\frac{1}{2}$ miles southward of the front range beacon of Kokinluoto, on its northeastern side, to Heponiemi ($60^{\circ} 29' N.$, $21^{\circ} 26' E.$), the southwestern end of Laupunen, on its southeastern side.

A light is shown on the northwestern extremity of Katanpää which lies close westward of Lypertö. This light is in range $206\frac{1}{2}^{\circ}$ with Mustaklupu Light.

Spar buoys mark the channel leading south-eastward through a narrows at Kustavi. From Kustavi the channel continues southeastward passing southwestward of the light beacon at Saviletto, about $\frac{3}{4}$ mile northwestward of Heponiemi, and thence westward of Heponiemi Light Beacon.

Pilots are stationed at Heponiemi.

There is an anchorage, marked by buoys, for a large vessel in about 9.1 m (5 fms.) on the northern side of Killeskar.

5E-17 Laupunen to Turku.—The entire channel between Laupunen and Lövskär, a track distance of 20 miles, is marked by range beacons. All are lighted except those on Lamholm and those off Hevoskakki. Laupunen Light Beacon is situated on the southern point of the island of the same name. This beacon is the front one of two, the rear unlighted, which in range 160° – 340° coincides with Ingastholm. Lamholm Beacons, indicating the initial range, are situated about 1 mile northwestward of Heponiemi Light Beacon ($60^{\circ} 29' N.$, $21^{\circ} 26' E.$).

The ranges indicating the track from a position westward of Heponiemi Light Beacon to its junction, westward of Lövskär, with the main tracks from Nyhamn and Utö are given below in sequence southward:

Lamholm Range astern bearing 307° for 1.6 miles to:

Ingastholm Range ahead bearing 160° for 3.7 miles to:

Bredskär Range astern and Ristluoto Range ahead bearing 318° and 138° , respectively, for 2.1 miles to:

Saukkoletto light ahead bearing 152° for 1.2 miles to:

Hevoskakki Range ahead bearing 162.5° for 1.5 miles to:

Kekoluoto Range astern bearing 300° for 5 miles, passing southward of the front range light on Kuiva Kalsaari (60°19'N., 21°44'E.), to:

Svartholm Range ahead bearing 197° for 4 miles, passing eastward of Kalvholmskobben Light Beacon (60°13'N., 21°43'E.) to the main track from Uto, close westward of Lovskar, described in section 5E-11, which see for description therefrom to Turku.

TURKU

Position: 60°27'N., 22°14'E.
Depths: Outer anchorage, 10.9 to 40 m (6 to 22 fms.).
 Roadstead, 4.5 to 6.1 m (15 to 20 ft.).
 Entrance channel to:
 Harbor (north of Iso-Pukki), 8 m (26 1/2 ft.).
 Harbor (south of Iso-Pukki), 2.8 m (9 1/2 ft.).
 Pansio Oil Berths, 8.9 m (29 1/2 ft.).
 Tupavuori Oil Berths, 8.9 m (29 1/2 ft.).
 Berths, 1.8 to 8.9 m (6 to 29 1/2 ft.).

Tidal rise: Negligible.

Port plan: Section 5E-25.

5E-18 The port of Turku consists of the area lying between the mouth of the Aurajoki and the waterways on either side of Ruissalo westward to as far as Koivuluoto and a point close southward of Iso Pukki. It comprises the main harbor at Turku, the berthing spaces within the Aurajoki and an oil harbor at Pansio, 1 1/2 miles westward of the main harbor. The city of Turku is principally situated on the northern side of the river.

Tupavuori the oil port for Naantali (Nodendal) is located about 3 miles westward of Pansio.

The port is reached by four principal channels through the Turku Archipelago; from Hanko, section 5E-2; from Uto, section 5E-8; from Nyhamn, section 5E-12; and from Enskar, section 5E-15. The shortest distance

from the open sea is 52 miles by way of Uto.
DEPTHS

5E-19 The outer anchorage between Rajakari and Kauppakari has depths of from 10.9 to 40 m (6 to 22 fms.) clear of several shallow patches marked by spar buoys.

The roadstead clear of the dolphins and the shoals bordering the shore has depths of from 4.5 to 6.1 m (15 to 20 ft.).

The main channel to Kanavaniemi, depth 8 m (26 1/2 ft.), leads westward and northward of Iso-Pukki. A secondary channel with a depth of 2.8 m (9 1/2 ft.) leads southward and eastward of Iso-Pukki.

A 10 m (33 ft.) channel leads westward of Ruissalo to about 3 1/4 miles northward of Rajakari light; and an 8.9 m (29 1/2 ft.) channel leads from there northward of Ruissalo to the oil berths at Pansio.

An 8.9 m (29 1/2 ft.) channel which branches off of the Pansio channel, about 1/4 mile northward of Iso Kaskinen light, leads northward and westward to the oil berths at Tupavuori.

There are depths of 4.5 to 6.7 m (15 to 22 ft.) in the lower part of the river.

ICE

5E-20 Ice may be encountered in the harbor and approach channels from December through April. The port has not been closed due to ice conditions for the past 50 years. Icebreakers keep the harbor open for shipping throughout the winter.

ANCHORAGES

5E-21 The outer anchorage is located between Rajakari (sec. 5E-6) and Kauppakari, 1 3/4 miles northeastward, and the shoals extending from Lapila, 1 1/2 miles northwestward. Brunholms, a 4.6 m (15 1/2 ft.) shoal marked by a spar buoy, lies about 1 mile north-northwestward of Rajakari. Several other shoals marked by spar buoys fringe the rim of the anchorage.

The roadstead, suitable only for small vessels, lies westward of Kanavaniemi between Ruissalo and Hirvensalo.

ENTRANCE CHANNEL AND NAVIGATIONAL AIDS

5E-22 Rajakari (sec. 5E-6) and Kauppakari (sec. 5E-21) are each marked by a light.

A LIGHT is located about 1/2 mile north-westward of Kauppakari Light.

Two islets, Iso Pukki and Pikku Pukki, to northeastward, lie between Ruissalo and Hirvensalo and divide the southern entrance into two channels.

The most direct channel with a depth of 2.8 m (9 1/2 ft.) passes eastward of Kauppakari, northwestward of Rautakallio Light Beacon, southward of the two islets, thence eastward of Kalkiniemi Light Beacon where it joins the main channel.

The main channel with a depth of 8 m (26 1/2 ft.) passes between Ruissalo and the two islets. The first reach is indicated by the SAKSA-ANNA LIGHT BEACONS, on the southern side of Ruissalo, in range 025° to and in the white sector of ARVIN SILMA LIGHT BEACON bearing between 045° and 051°; thence the channel passes between SPAR BUOYS and southeastward of the light beacons of Kalkiniemi and Ruissalo, and northward of those of Arola and Kivikari to either Kanavanemi or Aurajoki.

The channel from Rajakari to the Pansio oil berths leads westward and northward of Ruissalo and is marked by buoys and six ranges.

The front beacon of the first pair stands on the eastern end of Luonnonmaa and the rear one on the mainland northward. These beacons, are lighted and in range 347°, lead to the second pair of lighted beacons, in range 360°, located at Viheriainen, south-westward of Tupavuori. The third range is unlighted but lies within the white sector of Koivuluoto Light. The forward beacon is located on the islet of Verkkokari, the rear beacon in range 056° stands on the mainland. Kallanpaa lighted beacons, in line 122°, located on Ruissalo, form the fourth range. Hiiriluo and Kauppila lighted beacons in line 090° make up the fifth range. The sixth range, which leads up to Pansio oil harbor, is marked by two light beacons in range 071° and about 700 yards apart. The forward beacon is located about 1/4 mile north-northeastward of Kauppila light beacon.

The 8.9 m (29 1/2 ft.) channel, leading northward and westward from the main channel, to the oil berths at Tupavuori is marked by lighted ranges and buoys. Tupavuori oil pier is about 260 feet in length with depths of 6.8 to 10.3 m (22 to 34 ft.) alongside.

HARBOR

5E-23 The three harbors of the port include a main harbor, a river harbor and an oil harbor.

The main harbor lies at the southwestern point of the city of Turku and consists of the berthing spaces on the northern side of the Aurajoki, at Kanavanemi, Pohjoislaituri, Linnaaukko, Poikkilaituri and Lansilaituri.

The river harbor lies within the Aurajoki and consists of berthing spaces alongside the northern bank upstream from those of the main harbor, of berthing spaces alongside the southern bank and of those within several shipbuilding and repair facilities.

The oil harbor at Pansio consists of a single pier extending from shore with berths on each side. A water pipeline is laid north-northeastward from close westward of Kallanpaa front leading light to the western end of Pansio.

A breakwater extends east-southeastward from Ruissalo toward Kanavanemi. A causeway with an opening for small craft crosses northward of the main harbor between Ruissalo and the mainland. Craft with a draft of 5 feet can use a channel which connects the oil port with the main harbor. Work is in progress to extend Lansilaituri further southward and possible southwestward to Ruissalo with the intention of forming a main harbor almost surrounded with berthing space.

A submarine cable is laid in the river about 3/4 mile eastward of Kanavanemi.

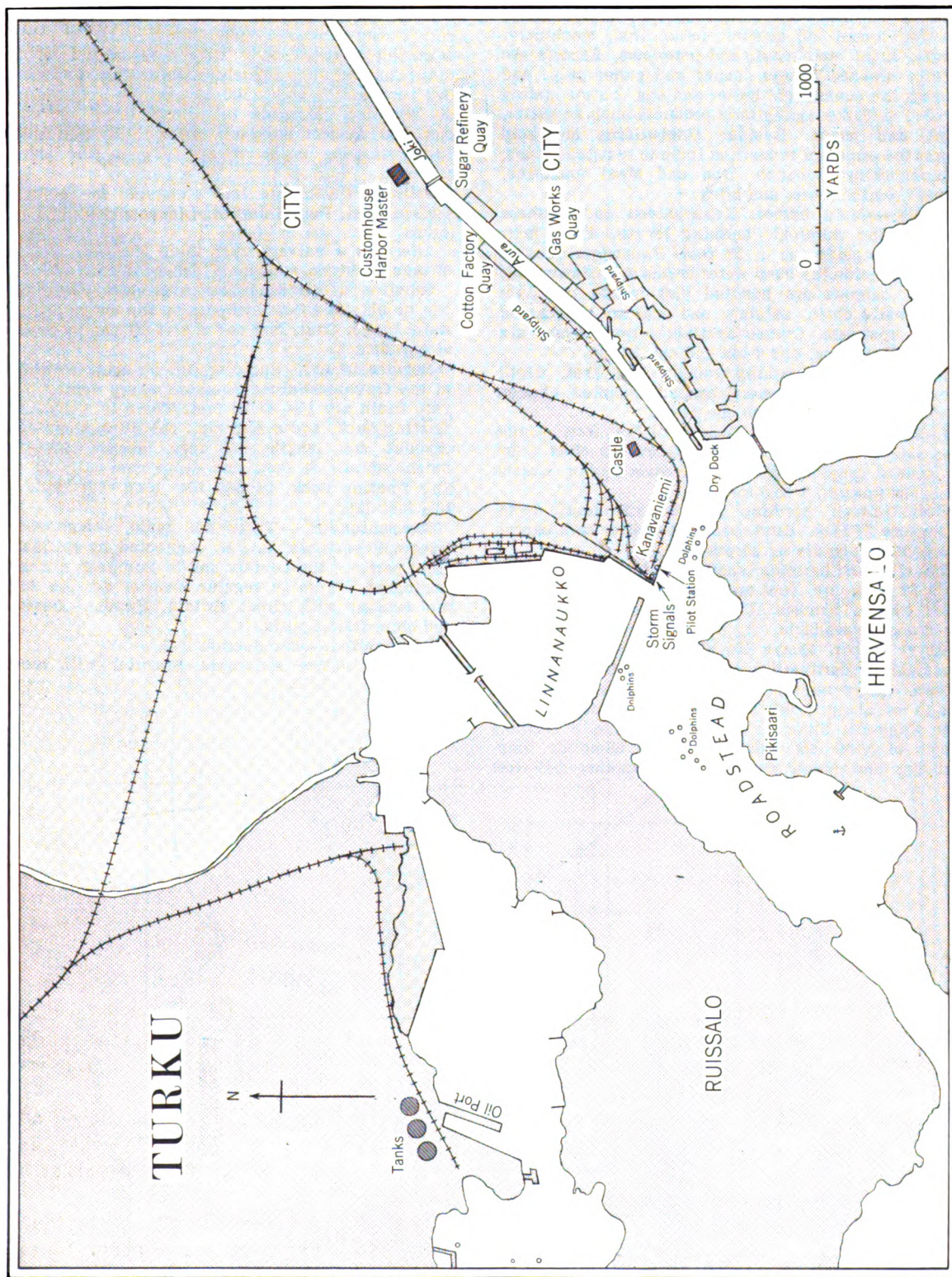
PILOTAGE

5E-24 Pilotage is compulsory. The pilot stations in the approach from Hanko are described in section 5E-2, those from Uto in section 5E-8, from Nyhamn in section 5E-12, and from Enskar in section 5E-15. The harbor pilot relieves the sea pilot off Pikisaari. Pilots are also stationed during the day at the SIGNAL STATION at Kanavanemi.

FACILITIES

5E-25 TURKU, also known widely by its Swedish name of Abo, is considered the oldest city in Finland and the birthplace of that country's culture. With a population of about 121,000 (1961), it ranks second in population, third in manufacturing, and is developing into the principal port of Finland.

The city lies astride of the mouth of the Aurajoki at the southwestern corner of Finland and is the (continued on page 210)



gateway of the most fertile part of that country. Imports consist of general cargo, iron, machinery, cotton, sugar, salt, coal, and petroleum. Exports are chiefly dressed lumber, paper and paper pulp, and through the government butter and egg control station located at Turku, agricultural products such as butter, eggs, and bacon. Besides shipbuilding and ship repair the principal industries include textiles, glass, cabinetmaking, tobacco, iron and steel foundries, cement, earthenware, and brick.

Berths.—Main harbor. Kanavaniemi and northern bank of the Aurajoki: berthing length, 4,331 feet; depths alongside, 20 to 27 feet. Passenger vessels come alongside the deep water berths at Kanavaniemi. Timber cargoes are handled just inside the river mouth while chalk, calcium, and coal are discharged further upstream. Cranes available: two 1½-ton, six 2½-ton, five 5-ton, one 7-ton and one 36-ton.

Pohjoislaituri: berthing length, 788 feet; depth alongside, 26 feet. General cargo is handled. Cranes available: one 1½-ton and one 5-ton.

Linnanaukko: berthing length, 4,200 feet; depths alongside 19 to 29½ feet. Berths are the chief point for general cargo handling in the main harbor. Cranes available: fourteen 5- to 6-ton.

Poikkilaituri: berthing length, 328 feet; depth alongside 24 feet. Sand, coal, and similar bulk cargoes are handled usually by ship's gear.

Länsilaituri: berthing length, 706 feet; depth alongside 27 feet. Ore, coal and similar bulk products are chief cargoes handled. Three 6-ton cranes and a 60-ton crane are available.

River harbor. Quays lie along both sides of the Aurajoki to Martinsilta, about ½ mile from the river mouth. Quays on the northern side have a berthing length of about 1,500 feet with depths of 14 to 21 feet alongside; those on the southern side, a berthing length of 2,100 feet with 6 to 16 feet alongside. Shipbuilding and repair facilities have another 659 feet

with 23 feet alongside. Berths, in general, accommodate coasting vessels. One 80-ton crane is available at the shipyard.

Oil harbor, immediately eastward of Pansio, has two berths, each about 500 feet in length with a depth of 29½ feet alongside the southeastern side of the pier and 21 feet alongside the northwestern side. A 30-ton floating crane is available in the shipyard at Pansio.

Railroad tracks are laid alongside the berths at Kanavaniemi, Pohjoislaituri, Linnanaukko and Länsilaituri.

There is a salvage tug; there are also a number of tugs, lighters, and motor launches.

Supplies of all kinds are available. Fresh water can be obtained from hydrants on the quays or from a water barge. Coal, fuel and diesel oil can be procured at any time.

Repairs of any character can be made to vessels at the Crichton-Vulcan shipyard where depths in the yard basin are 15½ to 30 feet. There is a drydock, a floating dock, and a slipway. The dimensions of the drydock are: length, 600 feet; breadth, 83½ feet; height of sill, 4 feet; and depth over sill, 27 feet. The floating dock, is 360 feet long, 50' wide and 16½ feet deep.

Communication.—Turku has radio, telephone and telegraph services, and is connected by railroad to other parts of the country and to European cities via Leningrad. There is regular steamer service during the summer with Great Britain, Sweden, Denmark, and other Baltic ports.

Deratization.—See section 1-7.

Hospital.—The Municipal Hospital will receive seamen.

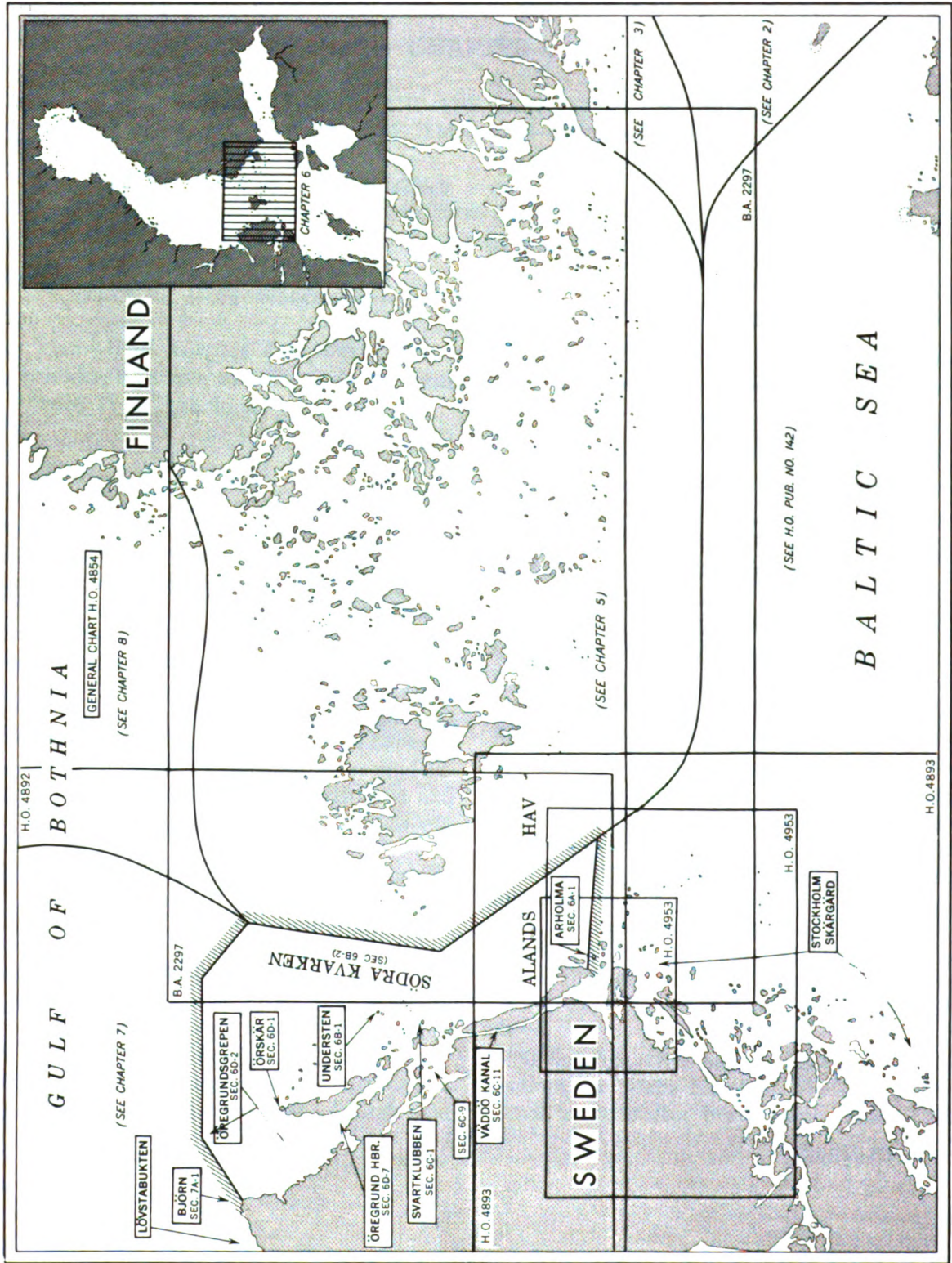


Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Navy Hydrographic Office. Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 6—GRAPHIC INDEX

CHAPTER 6

SÖDRA KVARKEN AND THE EAST COAST OF SWEDEN BETWEEN ARHOLMA AND LÖVSTABUKTEN

- Part A. Arholma to Svartklubben
- Part B. Södra Kvarken and Adjacent Dangers
- Part C. Svartklubben to Öregrundsgrepen, including the Fjords Southward of Öregrund
- Part D. Öregrundsgrepen to Lövstabukten

Plan.—This chapter describes a part of the east coast of Sweden bordering on Ålands Hav, Södra Kvarken, and the Gulf of Bothnia. The arrangement is northward and north-westward from Arholma.

GENERAL REMARKS

6-1 The east coast of Sweden between a position about 5 miles northwestward of the off-lying island of Arholma and a position 2 miles southward of the small island of Björn, on the eastern side of the entrance of Lövstabukten, trends very irregularly northwestward for about 53 miles. This stretch of coast is fronted by a few large islands and numerous small islands and islets. Innumerable off-lying rocks and shoals lie among and between the islands and the mainland. Foul ground extends a considerable distance northward and northeastward from most of the northeastern part of this area.

Väddö Kanal and its approaches separate the southern islands from the mainland; navigable passages and fjords indent the coast westward of the other off-lying islands.

Many small harbors and anchorages, available as harbors of refuge, lie in the fjords and among the islands. None of the harbors are very important commercially.

The outermost dangers, those adjacent to the passages leading among the islands and

to the harbors, and those on either side of Södra Kvarken will be described.

Södra Kvarken, at the northern end of Ålands Hav, joins that sea with the Gulf of Bothnia. Directions are given for this passage.

Stockholm Skärgård, the extensive area in the approaches to Stockholm Harbor, is formed by an archipelago of islands and numerous rocks and shoals. It extends south-westward from the vicinity of Arholma and is described in H. O. Pub. No. 43.

Caution.—Strangers proceeding through Ålands Hav and Södra Kvarken should take into consideration that the Swedish coast and its fringing islands are comparatively high and that the Finnish coast, to the eastward, is low. Also, the Swedish side, bordering on Ålands Hav, is mostly steep-to; on the Finnish side detached islands, rocks, and foul ground lie a considerable distance off-shore.

Navigation.—See section 6B-6 for the directions for Södra Kvarken. For the navigational track leading north-northeastward be-

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tween Södra Kvarken and Norra Kvarken (sec. 9C-2), see section 7-3.

ICE

6-2 Ice conditions prevail in the area covered by this chapter; for particulars and ice chartlets, see chapter 1.

MAGNETIC DISTURBANCE

6-3 Abnormal magnetic conditions are reported in the area between Understen, Singö, and Gräsö.

SURVEYING MARKS

6-4 Special beacons and buoys, for surveying purposes, are occasionally placed on the Swedish coast during the summer; mariners are warned not to mistake these for navigational aids.

Part A. ARHOLMA TO SVARTKLUBBEN

6A-1 Arholma ($59^{\circ}50'N.$, $19^{\circ}07'E.$) is a wooded island, 92 feet high, lying off the southeastern side of Björkö and is separated from the latter island by the northernmost of the channels leading from Ålands Hav into Stockholm Skärgård (H.O. Pub. 43). Arholma is about $2\frac{1}{2}$ miles long, north and south, and has a very irregular shore line. A number of smaller islands lie off the southern, eastern, and northern sides of Arholma; navigable passages separate some of them.

Range lights for the northern reach of a channel leading along the eastern side of Björkö (sec. 6A-7) are shown on the western side of Arholma. Arholma Beacon stands on the summit of Arholma close northeastward of the front light.

COAST—GENERAL

6A-2 The islands fronting the Swedish coast on the western side of Ålands Hav extend about 27 miles north-northwestward

between the southern end of Björkö, lying close westward of Arholma, and the northern end of Singö. Svartklubben is a rock about $\frac{1}{2}$ mile off the eastern side of Singö.

Björkö extends northwestward about 8 miles and joins the island Vaddö (Wäddö) which continues north-northwestward for an additional $11\frac{1}{2}$ miles. Byholma is a small peninsula connected to the northeastern side of Vaddö by a narrow isthmus. Fogdö and several other small islands lie on foul ground between the northern side of Byholma and the island Singö, about 2 miles northward. Several small harbors and anchorages are located among these islands.

DEPTHS—DANGERS

6A-3 The eastern coasts of the islands extending from Arholma to Singö are comparatively steep-to. Charted dangers lie up to 1 mile offshore; they all lie within the 20-fathom curve and are described with the related features.

NAVIGATION

6A-4 From a position about $1\frac{3}{4}$ miles northeastward of Högsjär in the eastern approach to Arholma Entrance (sec. 6A-6), a course of 346° for $21\frac{1}{4}$ miles leads over a least depth of 55 fathoms to a position in the approach to Södra Kvarken about $5\frac{3}{4}$ miles northeastward of Svartklubben and about $3\frac{1}{4}$ miles southeastward of Understen (sec. 6B-1).

COASTAL FEATURES—LANDMARKS

6A-5 Österhamn. — Österhamn, on the southeastern side of Arholma, is a good but restricted harbor. Anchorage can be taken in depths of $3\frac{1}{4}$ to $5\frac{1}{2}$ fathoms, mud and clay. A pier, with a depth of 9 feet alongside, projects from the northwestern side of the harbor. Pilots may be obtained from Arholma (sec. 6A-6).

Two channels are available to vessels with a draft of 13 feet. The northern channel leads between the eastern side of Arholma, on the west, and Demban, an above-water rock, Ovanskär, Gransk, and Björskär, on the east, thence between the southeastern side of Arholma and Villösan. The southern channel leads close along the western side of Villösan from southeastward.

Directions—Northern channel.—Steer 227° toward Arholma Beacon, and when about 1 mile from the land and the beacon just dips under the tops of the trees on Arholma, Demban should show between Arholma and Ovanskär. When Demban comes in range with Ovanskär, steer southward between the former and Arholma and keep about 100 yards off Ovanskär until Arholma Beacon opens southward of a point of the island, bearing about 299°, and right over Österhamn. Round the point, keeping 200 yards southward of it to avoid a reef extending in that direction, and steer toward the beacon, anchoring in the middle of the harbor.

Storgrund, a shoal with a least depth of 1.8 m (1 fm.) and marked on its northern side by a spar buoy, lies about 800 yards north-northeastward of the northern end of Arholma.

ARHOLMA ENTRANCE OF STOCKHOLM SKÄRGÅRD

6A-6 This entrance has two main channels leading southward from Ålands Hav into Stockholm Skärgård between Björkö and Arholma. Both channels can be used by vessels with a draft of 29½ feet. The northeastern channel passes close northwestward of Högsjär Light, standing on an islet about 1½ miles northward of Arholma Beacon. Högsjär Beacon stands on Högsjär, a larger islet close southward of the light. The northern channel passes westward of Simpnäsklubb Light, located on Skomakaren, a rock 1½ miles northwestward of Högsjär Light. These two channels meet about ½ mile southwestward of Högsjär Light.

A third channel, available to vessels with a draft of 16½ feet, leads southwestward, passes close southeastward of Villösan, and joins the main channel about 1¼ miles southward of Arholma. Another channel, for vessels with a draft of 13 feet, leads along the eastern side of Arholma and joins the above-described channel about 800 yards south-southwestward of Arholma. Pilots are necessary for these channels.

Navigational aids.—In addition to aids already described, Arholma Entrance channels are marked by buoys; several lights are shown on the east coast of Björkö. Svedudden Light is shown from a position on the western side of the narrowest part of the main channel about ¾ mile westward of Arholma rear range light. Dejeudden Light is located about 1 mile northward of Svedudden Light, and Näskubben Light is located about 1 mile farther northward. An air light is located near Simpnäs about ¾ mile southwestward of Näskubben Light. Bylehamn Fishing Light is shown nearly 3 miles west-northwestward of Simpnäsklubb. A radiobeacon transmits and fog signals are sounded at Simpnäsklubb Light.

Caution—Mined area.—A defensive area, through which surface navigation is permitted, lies between Arholma and Björkö. Due to the possible presence of bottom mines anchorage and fishing are prohibited in the fairway between positions about 600 yards southward and 800 yards northward of Svedudden Light. Vessels transiting this passage during thunderstorms do so at their own risk.

Submarine cables (sec. 1-34) are laid across the channel about ¼ mile southward of Svedudden Light; cables are also laid between Näskubben and Simpnäsklubb light structures.

A submarine cable is laid across Ålands Hav between a position close southward of Näskubben Light and a position on Åland Island about 25 miles to the northeastward.

Anchorage.—Vessels with local knowledge can take anchorage in Granskärs Redd in

depths of 16.4 to 26 m (9 to 14 fms.), clay, off the eastern side of Bjorko about 3/4 mile southward of Svedudden Light. A small pier, with a depth of 2.4 m (8 ft.) alongside, extends from the northern shore of this roadstead.

Pilots.—Arholma pilot station, with its lookout tower, is located at Näskubben, on the eastern coast of Björkö about 400 yards southward of Näskubben Light. Pilots board north-bound vessels in the channel abreast the pilot station and other vessels 1 to 2 miles off the outer rocks or shoals. Pilots from this station conduct vessels as far southward as Furusund (H.O. Pub. 43). Pilots should be employed for all the channels of Arholma Entrance. See section 1-25 for general pilotage information.

Arholma lifesaving station with rescue craft and line-throwing apparatus is maintained at Simpnäsvik, about 1/2 mile southward of Näskubben Light.

6A-7 Directions for Arholma Entrance.

—**Northeastern approach:** Steer for Högsjär Light structure bearing 230°, and when about 700 yards from it, steer to pass between it and Tallriken, a shoal awash about 400 yards northward and marked by a ball spar buoy; thence steer between Högsjär Beacon and several shoals marked by plain spar buoys northwestward of it; thence alter course southward and pass westward of the broom spar buoy marking the outer end of the foul ground extending southwestward from Hogskar and westward of a 5.8 m (3 1/4 fm.) patch marked by a broom spar buoy about 1,200 yards farther southward; thence pass between Svedudden Light struc-

ture and some shoals marked by two broom spar buoys eastward of it; thence pass close eastward of a plain spar buoy marking the edge of the coastal bank about 600 yards southward of the light structure; thence anchor in Granskars Redd or, if proceeding southward, follow the track indicated on the chart.

Northern approach: Steer for Simpnäsklubb Light structure on a heading between 156° and 225°. Arholma Beacon bearing about 158° and open northeastward of Näskubben Light structure leads northeastward of Utånaggrund (sec. 6A-8). When about 1 mile from Simpnäsklubb Light structure, bring Arholma range light structures in range 164°. As the channel here is very narrow, keep these lights accurately in line. The channel leads close westward of Simpnäsklubb Light structure, thence close eastward of Bredbådan, awash and marked by a ball spar buoy about 800 yards southward of Simpnäsklubb Light structure, thence close westward of Gävlehästen, an above-water rock marked by a beacon with a radar reflector, and a shoal awash about 1,300 yards southward of the same light structure and marked by two broom spar buoys. A 5.5 m (3 fm.) patch lies about 300 yards north-northwestward of Gävlehästen. Bokobben a small island about 150 yards westward of Gävle hasten, is marked by a beacon with a radar reflector. The range line leads about 50 yards westward of this patch and about 60 yards eastward of a reef extending from Bjorko. Pass eastward of the plain spar buoy marking the coastal reef off Näskubben, thence westward of a broom spar buoy

marking the western side of a 2 1/4-fathom patch about 800 yards westward of Hogskar Light structure and westward of a plain spar buoy marking a 5.5 m (3 fm.) patch close south-southeastward of the 3.9 m (2 1/4 fm.) patch, thence eastward of Simpnasgrynnan light marking a 2.1 m (1 1/4 fm.) shoal close off the eastern side of Bjorko about 1,200 yards southward of Naskubben Light structure. From this position follow the directions previously given for the northeastern approach.

COASTAL FEATURES—LANDMARKS (Continued)

6A-8 The coast between Arholma Entrance and Grisslehamn, about 15 miles north-northwestward, is wooded. Vaddö Kasberg, an isolated, 164-foot hill with a bare summit, is located in the southern part of Vaddö and is fairly conspicuous. The coast of Vaddö is rocky except for a 3 1/2-mile stretch southward of Grisslehamn, where it is moderately steep-to.

Utänggrund, a shoal awash and marked on its eastern side by a spar buoy with a ball topmark, lies about 1 1/4 miles north-northwestward of Simpnasklubb Light.

The outermost dangers off this coast all lie within 1 mile of the shore and, in order northwestward, include: Flisaläggorna, awash, Karviksläggen and Rönskärsläggen, each with a depth of 1.5 m (5 ft.), Hamnlaggorna, awash, and Bysholmen, above water.

Gamla Grisslehamn, a small exposed harbor about 8 1/2 miles northwestward of Simpnasklubb Light, has a depth of about 2.4 m (8 ft.). Many unmarked dangers lie off the harbor. Pilots can be obtained from Arholma or Svartklubben (sec. 6C-7). Two cairn beacons in range 289° indicate the southern fairway leading to the harbor.

Grisslehamn (60°06' N., 18°49' E.), a loading place located on the narrow isthmus uniting Vaddö with the peninsula of By-

holma, has two harbors, one on each side of the isthmus. The eastern harbor, which is open to winds between east and south, has a general depth of about 6.4 m (3 1/2 fms.) and about 558 feet of quays with 1.9 to 4.4 m (6 1/2 to 14 3/4 ft.) alongside. A shoal, with a depth of 4.9 m (2 3/4 fms.) at its outer end and marked by a spar buoy, extends about 3/4 mile southeastward from Byholma on the northeastern side of the eastern harbor entrance.

The western harbor, in the inner part of Ornefjorden (sec. 6C-10), has a depth of about 3.3 m (11 ft.); alongside the small piers there the depth is about 2.4 m (8 ft.).

Pilots for Grisslehamn can be obtained from Arholma and Svartklubben (sec. 6C-7) by arriving vessels; those leaving obtain them from Svartklubben.

Anchorage can be taken off the eastern harbor in a depth of 8.2 m (4 1/2 fms.), sand and clay, westward of Loskaret, a barren and rocky islet located close off the northern entrance point of the harbor. Vessels in this anchorage must be ready to proceed to sea if the wind shifts unfavorably.

Vessels approaching the eastern harbor should steer for Löskäret bearing between 300° and 325° and, when about 400 yards from it, alter course to the westward and follow the fairway into the harbor. Directions for the western harbor are given in section 6C-10.

The town of Grisslehamn is situated on the isthmus between the two harbors. It has a customs station. Water and a small quantity of provisions are obtainable. A small boat yard builds lighters and has a marine railway with the following dimensions: overall length, 350 feet; cradle length, 110 feet; depth on blocks, 6 feet forward and 10 feet aft; lifting power, 350 tons. The town has telephone and telegraph services. Steamer communication is maintained with Stockholm and other nearby ports.

A light is shown on Högkobben, an islet close northward of the eastern extremity of Byholma.

Fogdö, an island about $1\frac{1}{2}$ miles long, north and south, is separated from the northern end of Byholma by a narrow channel, named Fogdö Ström, which has a least depth of about 2.4 m (8 ft.). A fishing light is shown occasionally on the northwestern extremity of Fogdösten, a small island separated from the eastern end of Fogdö by a narrow channel.

Singosund, a buoyed channel between Fogdö and Singo, to the northward, has a least fairway depth of about 2.7 m (9 ft.). As the channel is very intricate, it is only suitable for short and easily maneuvered vessels. A strong current sets through the passage at times, and a pilot is necessary for strangers.

Bridge spans were completed in 1961 connecting Singo, Fogde, and Byholma with Vaddo. The southern span over Singosund has a vertical clearance of 26 feet.

Bredbadan, a shoal with a depth of 4.5 m (2 $\frac{1}{2}$ fms.) and marked on its southern side by a spar buoy, lies on the northern side of the fairway about 1 mile northeastward of the entrance of Singosund.

Riddarskar Beacon stands on an islet in the eastern entrance of Singosund. A 2.4 m (8 ft.) shoal, marked on its southern side by a spar buoy, lies close southeastward of the beacon.

Anchorage is available to vessels with local knowledge in the western part of Singosund in depths of 11.9 to 13.7 m (6 $\frac{1}{2}$ to 7 $\frac{1}{2}$ fms.), gravel and mud.

Directions.—Vessels approaching Singosund should, when about 1 $\frac{1}{2}$ miles from Riddarskar Beacon, steer for it on a bearing between 256° and 278° and should pass southward of Bredbadan, thence southward of the buoy marking the 2.4 m (8 ft.) shoal in the entrance through the buoyed channel.

Passages leading from the western end of Singösund are described in section 6C-10.

Svartklubben lies about 2 miles north-northeastward of Singösund entrance. A description of this rock and the channel leading northwestward from it begins in section 6C-1.

ANCHORAGES

6A-9 Österhamn.—See section 6A-5.

Granskärs Redd.—See section 6A-6.

Grisslehamn.—See section 6A-8.

Singösund.—See section 6A-8.

Part B. SÖDRA KVARKEN AND ADJACENT DANGERS

6B-1 Understen Light ($60^{\circ}17' N.$, $18^{\circ}55' E.$), standing on Understen, a large barren rock about $6\frac{3}{4}$ miles north-northeastward of Svartklubben and Märket Light, standing on Märket, a rock about $6\frac{1}{2}$ miles farther east-northeastward, are the principal marks for Södra Kvarken. An auxiliary light is shown, fog signals are sounded, and a radiobeacon is operated from Understen Light structure. A disused light tower and other buildings stand near Understen Light. Fog signals are also sounded from Märket Light structure.

A defensive area, through which surface navigation is permitted but in which anchorage is dangerous due to the presence of bottom mines, is located in Södra Kvarken between Understen and Market. (See section 1-31.)

GENERAL REMARKS

6B-2 Södra Kvarken (South Quarken) is the passage leading northward from Ålands Hav into the Gulf of Bothnia. It lies between the eastern edge of the dangers extending northward from Svartklubben for about 20 miles and lying about 18 miles eastward of Gräsö and Örskär (sec. 6C-2) and the dangers extending westward from the Åland Islands. On the eastern side of Södra Kvarken are Märket, the several dangers lying south-southeastward and northwestward of that

rock, and Storbrotten, about 8 miles north-northeastward.

DEPTHS

6B-3 The least depth in the fairway through Sodra Kvarken is 12.8 m (7 fms.), which is found in its narrowest part. Depths elsewhere in the passage and in its approaches vary between 37 to 275 m (20 to 150 fms.).

DANGERS ON WESTERN SIDE OF SODRA KVARKEN

6B-4 Halsaren (Halsarn), a small, but conspicuous, dark-colored pinnacle rock, is located about midway between Svartklubben and Understen and 3 1/4 miles southward of the latter. A 9.1 m (5 fm.) patch lies 1/2 mile east-northeastward of Halsaren.

Travarn (Trafvärn), a rock considerably smaller than Halsaren, lies about 1 mile northward of it. When there is any sea, the breakers on Travarn are visible from a considerable distance.

Nyberget, with a depth of 9.4 m (5 1/4 fms.) and Oldbergsgrund, with a depth of 9.1 m (5 fms.), are shoals lying 1 1/2 and 2 1/4 miles north-northeastward of Understen. A ridge, with a least depth of 12.8 m (7 fms.), extends 1 1/4 miles northeastward from Nyberget. The eastern, western and northern sides of Oldbergsgrund and the southern side of Nyberget are marked by spar buoys.

Hoppetsgrund, with a depth of 3 m (1 1/4 fms.), and Baldersgrund, awash, lie 5 and 5 3/4 miles north-northwestward of Understen. Westward of the latter is Graskalsbadan, a group of low rocks. A spar buoy marks the eastern side of Hoppetsgrund.

Grundkallegrund, a shoal of considerable extent, lies with its northern extremity about 14 miles northward of Understen, and consists of Klacken, a rock 3 feet high and marked by a light fitted with a radar reflector, and numerous steep-to shoals. Some of these shoals are awash; others have little water over them. A spar buoy marks the eastern side of Grundkallegrund. A 12.8 m (7 fms.) patch lies about 3 3/4 miles northeastward of Klacken.

A lighted whistle buoy with a radar reflector is moored on Dittmansgrund, a shoal patch lying nearly 4 miles northeastward of Klacken light.

Grundkallen Light (60°30'N., 18°51'E.) is shown from the northern extremity of Grundkallegrund. A fog signal is sounded. A 12.8 m (7 fms.) patch lies about 5 1/4 miles north-northwestward of Grundkallen Light.

DANGERS ON EASTERN SIDE OF SODRA KVARKEN

6B-5 Solovjeva, with a depth of 6.7 m (3 3/4 fms.), is the southernmost of a string of detached rocks and shoals extending about 7 miles southward from a position about 1 mile eastward of Market. Northward of Solovjeva these dangers include: Brentonsgrund, with a depth of 4.9 m (16 ft.), Sodra Sankan, with a depth of 0.6 m (2 ft.), Sankan (Stor Sankan), awash, and Norra Sankan, with a depth of 1.2 m (4 ft.). The three southern dangers are each marked by a spar buoy. Other dangers are charted within 1/2 mile southeastward and 1 1/4 miles northeastward of Market.

Marketshallar, an above-water rock, and Marketskallen, a rock awash, lie 3/4 mile and 1 1/4 miles northwestward of Market. A 9.1 m (5 fm.) shoal lies about 1/2 mile southward of Marketshallar, and a 4.5 m (2 1/2 fm.) shoal and an 8.5 m (4 3/4 fm.) shoal lie within 1/2 mile west-northwestward of Marketskallen. A lighted whistle buoy equipped with a radar reflector, and spar buoys are moored on the western side of these dangers. A 7.6 m (4 1/4 fm.) patch, with a spar buoy moored close southward of it, lies about 5 1/2 miles north-northeastward of Market.

Shoals.—A cluster of shoals with a least depth of 10 m (5 1/2 fms.) lies about 8 miles north-northwestward of Market. A lighted whistle buoy and a spar buoy, close by, are moored on the western edge of these dangers.

Storbrotten, a shoal lying about 8 miles north-northeastward of Market, has a least depth of 2.7 m (1 1/2 fms.) near its western end which is marked by a spar buoy. An 11.9 m (6 1/2 fm.) patch lies about 2 1/2 miles westward of this western end of Storbrotten.

The dangers lying eastward of the above-described outermost dangers are described in sections 5C-3 and 5D-3.

DIRECTIONS FOR SÖDRA KVARKEN

6B-6 Vessels approaching Södra Kvarken from Ålands Hav should steer for Understen Light structure bearing 326° until Svartklubben Light structure (sec. 6C-1) is abeam; thence steer 000° , which leads eastward of Understen and Oldbergsggrund and nearly 4 miles eastward of Grundkallen Light, thence alter course as necessary into the Gulf of Bothnia. The least channel depth on the track between Ålands Hav and Grundkallen Light is 12.8 m (7 fms.). Greater depths are available through Södra Kvarken.

When passing through Södra Kvarken the vessel's position should be frequently ascertained, as the current is very strong and uncertain at times, and soundings give no warning of approach to some of the steep-to off-lying shoals.

Vessels proceeding through Södra Kvarken from the Gulf of Bothnia should exercise great caution. The current usually sets in a southerly direction, especially at the beginning of summer; when the ice disappears the current is strongest and is generally accompanied by fresh northerly winds. To avoid the numerous shoals extending along the eastern side of the passage, after passing about 5 miles eastward of Grundkallen Light steer for Understen Light structure bearing 194° until within $7\frac{1}{2}$ miles of it, thence steer 180° through Södra Kvarken and into Ålands Hav.

Part C. SVARTKLUBBEN TO ÖREGRUNDSGREPEN

6C-1 Svartklubben ($60^\circ 11' N.$, $18^\circ 50' E.$), a small dark rock 23 feet high, is one of the number of islets and rocks lying off the eastern side of Singö. Svartklubben

Light is shown on this rock near the eastern edge of the dangers. A fog signal is sounded

A lifesaving station is maintained at Svartklubben.

COAST—GENERAL

6C-2 The Swedish coast between Svartklubben and the northern extremity of Örsjär, the small island on the eastern side of the entrance of Öregrundsgrepen about 25 miles northwestward, consists of a chain of several islands and numerous close-lying islets. The eastern and northern coasts of Singö, Gräsö, and Örsjär border on the southern part of Bottenhavet, the southern half of the Gulf of Bothnia.

Most of the area immediately northward and eastward of these islands is foul with rocks and shoals and is encumbered with numerous small islets. The approximate limits of this area can be defined by a line extending from Svartklubben to Understen (sec. 6B-1), thence northward for about 15 miles, and thence westward for 15 miles to the northern end of Örsjär. The outermost of these dangers, forming the western side of Södra Kvarken are described in section 6B-4. Dangers along the outer northern edge will be described below, as will those adjacent to the navigable channels among the islands.

Svartklubben Entrance is one of the main approaches to channels leading to the harbors of Öregrund, Östhammar, and those in the fjords westward and southward of Singö. The channels leading northwestward to Öregrund, thence through Öregrundsgrepen, can frequently be used with advantage at night and in bad weather by vessels with local knowledge instead of Södra Kvarken, especially as good anchorage can be obtained in several places along this track.

Väddö Kanal extends southward from the easternmost fjord, joining it with Stockholm Skärgård.

DEPTHS

6C-3 A draft of $24\frac{1}{2}$ feet can be taken through the channel leading northwestward from Svartklubben Entrance to Öregrund Harbor and passing along the northeastern side of Getryggen (sec. 6C-7). The reach of the channel passing along the southwestern side of this shoal can be used by vessels with a draft of 18 feet. The wider channel leading from Jössan Entrance, about 2 miles north-eastward of Svartklubben, can accommodate a draft of $29\frac{1}{2}$ feet as far as Öregrund Harbor.

A draft of 8½ feet can be taken through the channels leading to Östhammar and in the approaches to and through Vaddö Kanal. A draft of $24\frac{1}{2}$ feet can be taken through the channels leading to Hargshamn and some of the other small harbors in Galtfjärden and Singöfjärden. Depths in the anchorages and harbors inside these fjords are adequate for vessels reaching them.

DANGERS—OFF-LYING DANGERS

6C-4 Dangers adjacent to the principal channels leading among the islands are described with the channels.

Kappelsgrund, on which the sea breaks, lies on the northeastern side of Svartklubben Entrance and is marked on its southwestern side by a spar buoy, equipped with a radar reflector. **Mässten**, a moderately high islet, is located about $\frac{1}{4}$ mile northeastward of Svartklubben. Foul ground, marked by two spar buoys, extends about 1,200 yards southwestward and westward from Mässten.

Giffardsgrund, a 3 m (1 $\frac{3}{4}$ fm.) patch, lies about 4 miles west-northwestward of the northern extremity of Grundkallegrund (sec. 6B-4) and about 9 miles eastward of Orskar. A spar buoy marking the northeast side of a 10.3 m (5 $\frac{3}{4}$ fm.) patch, is moored about 2 miles northward of Giffardsgrund.

Argosgrund, with a least depth of 1.8 m (1 fm.), lies about 6 miles northward of the northern extremity of Orskar; spar buoys mark its northern and southern sides. **Argosgrund Light** stands on the shoal. Fog signals are sounded here.

A dangerous wreck lies about 2 miles southward of Argosgrund Light.

Argos Ytterbank, with depths of 12.8 to 29 m (7 to 16 fms.), extends from $1\frac{1}{2}$ mile to $3\frac{1}{2}$ miles northward from Argosgrund.

Argos Innerbank, with a least depth of 10 m (5 $\frac{1}{2}$ fms.), lies about $1\frac{3}{4}$ miles southeastward of Argosgrund.

Prejaren, a shoal with a least depth of 5.5 m (3 fms.), lies northward of Orskar. A spar buoy, moored about $1\frac{1}{2}$ miles north-northwestward of the northern extremity of Orskar, marks the northern side of Prejaren. A 6.4 m (3 $\frac{1}{2}$ fm.) patch, marked on its northern side by a spar buoy, lies about $1\frac{3}{4}$ miles north-northeastward of Orskar.

The wreck of the *Vesta* lies sunk about 4 miles north-northwestward of Örskär.

Lifeboat patrol.—A white rescue-cruiser named *K. A. Wallenberg* and with the station name *Orskar* painted in black on its sides and a distinguishing flag, patrols in thick and bad weather from September 15th to the close of navigation and from the opening of navigation to May 31st between Grundkallen Light and a position about 10 miles westward of Örskär. The vessel is equipped with radar and is able to assist in position-finding during fog or snow. Vessels may communicate with the rescue cruiser by radio via the station at Härnösand (sec. 7D-9). When not on patrol, the rescue cruiser is normally stationed in Alskärsviken (sec. 6D-6), on the northwestern side of Gräsö.

NAVIGATION

6C-5 The navigational track given in the directions for Sodra Kvarken (sec. 6B-6) leads northward and passes about 4 miles eastward of Grundkallen Light. From this position steer 304° for $21\frac{3}{4}$ miles over a least charted depth of 17.7 m (9 $\frac{3}{4}$ fms.) to a position nearly 10 miles northward of Orskar Light (sec. 6D-1).

Vessels bound for Öregrundsgrepen may, from the same position about 5 miles eastward of Grundkallen Light, steer 304° for $8\frac{1}{4}$ miles, then change course to 270° and maintain it for $11\frac{1}{4}$ miles to a position $2\frac{1}{2}$

miles northward of Orskar Light. This track leads over a least depth of 14.9 m (8 1/4 fms.) and passes about 1/2 mile northward of the 6.4 m (3 1/2 fm.) patch lying north-northeastward of Orskar.

CURRENTS AND WINDS

6C-6 See sections 1-37 and 1-42.

SVARTKLUBBEN AND JÖSSAN ENTRANCES—CHANNELS

6C-7 Svartklubben Entrance lies between Svartklubben and Kappelsgrund and the other dangers to the northeastward and northward. The fairway width in the entrance is about 400 yards.

The channel leading from Svartklubben Entrance continues northwestward for about 15 miles to Öregrund Harbor at the head of Öregrundsgrepen and is marked by lights and buoys, but is available only to vessels with local knowledge. Other channels join this main channel and lead into the fjords to the southward and westward.

This main channel passes between Stångskär, Singö, Långgrundet, Höggrund, Tolvöreggrund, Alnö, Klykskär, Stora Karingön, and numerous smaller islands, islets and rocks on the southwestern side and Gässten, Jössan, Vässarö, Enholmen, Ormön, Sladardön, Björkholmen, Farön, Gräsö, and numerous other islets and rocks on the northeastern side.

The seaward approaches to Öregrund are enclosed within an irregularly shaped protected area. Foreign vessels are cautioned that while navigating through the area they must remain within the generally used channel between Svartklubben and Tolvöreggrund.

Pilots.—Svartklubben is a pilot station. Pilots meet vessels outside the outer shoals off Svartklubben Entrance and in the fjord westward of Svartklubben. See section 1-25.

Anchorage can be taken by vessels with local knowledge in a position 400 to 600 yards west-northwestward of Svartklubben in depths of from 10 to 17.7 m (5 1/2 to 9 3/4 fms.), sand and mud.

A rescue cruiser is stationed in the bay on the northeastern side of Singö about 2 miles northwestward of Svartklubben.

About 1 1/2 miles northwestward of Svartklubben Entrance the channel divides; the southwestern part, with a least depth of 5.5 m (18 ft.), leads between Stångskär, a partly wooded islet lying close off the northeastern side of Singö, and Getryggen, a 2.7 m (1 1/2 fm.) shoal in the middle of the fairway; the northeastern part of the channel, with a least depth of 7.4 m (24 1/2 ft.) leads between Getryggen and an islet to the northward.

Singö Långör Light is shown on an islet about 1/4 mile off the eastern side of Singö and nearly 1 mile west-northwestward of Svartklubben. Singö Stångskär Light is shown on Stångskär.

Spar buoys mark the reefs and shoals extending from islands and islets on either side of the channel. Several spar buoys mark Getryggen. Range lights for Svartklubben Entrance and the southwestern part of the channel leading past Getryggen are shown on the southwestern side of Gässten, a small island located about 600 yards northward of Stångskär.

Range lights for the channel reach on the northeastern side of Getryggen are on an islet located westward of Gässten range lights.

Råstensudde Light is shown on the southwestern side of the channel in a position near the northern extremity of Singö.

Skogsskar Light is shown on the southwestern end of an island about 1 1/2 miles northeastward of Råstensudde Light.

Vässarögrund Light marks a foul area located about 1 1/4 miles northwestward of Råstensudde Light. A spar buoy is moored close northward. The light was demolished (1966) by ice.

Caution.—An unmarked 9.1 m (5 fm.) patch lies close southward of the fairway in a position about 1/2 mile eastward of Vässarögrund Light.

Tolvöreggrund Light marks the northwestern end of an islet on the southwestern side of the channel about 3 3/4 miles northwestward of Råstensudde Light. An auxiliary light is shown from a position close northeastward of Tolvöreggrund Light.



Hummelgarden Light marks a shoal of the same name on the southwestern side of the channel about 1 mile northwestward of Tolvöreggrund Light.

Färöhällan Light is shown on the northeastern side of the channel in a position about $3\frac{1}{4}$ miles northwestward of Tolvöreggrund Light.

Käringön Light is shown on the northern extremity of Stora Käringön, an island located on the southwestern side of the channel about 4 miles northwestward of Tolvöreggrund Light.

Sysran Light and Skeppshällan Light mark dangers on the southwestern side of the channel in positions $1\frac{1}{2}$ and 2 miles northwestward of Käringön Light. A light, for the use of pilot vessels, is occasionally shown on the shore about $\frac{3}{4}$ mile northwestward of Skeppshällan Light.

The lights in the vicinity of Öregrund are described in section 6D-7.

Anchorage can be taken by vessels with local knowledge in Gåssten Redd, on the northeastern side of Singö, in a position from 400 to 600 yards southwestward of Gåssten front range light, in depths of $6\frac{1}{2}$ to 11 fathoms, sand and gravel; the holding ground is not very good.

6C-8 Jössan Entrance ($60^{\circ}12' N.$, $18^{\circ}52' E.$) is located about 2 miles northeastward of Svartklubben and about $1\frac{1}{2}$ miles southwestward of the conspicuous Halsaren (sec. 6B-4). This entrance, which is wider than Svartklubben Entrance, lies between Måskobben and Stora Korssten, a rock and an islet to the southwestward, and Halsaren, Hällskären, and dangers close southward of the latter islet to the northeastward.

The channel leading northwestward from Jössan Entrance joins the one leading to Öregrund Harbor in a position $\frac{1}{2}$ mile westward of the western extremity of Vässarö and about $6\frac{1}{2}$ miles from the entrance.

Jössan Light is shown from Kofoten, a rock about $\frac{3}{4}$ mile north-northeastward of Råstensudde Light; in range with Tolvöreggrund Light, it marks the fairway of the channel as far as a position where the channel turns to round Kofoten, a distance of about 4 miles from the entrance.

Two buoys are moored near the southern edge of the dangers on the northeastern side of Jössan Entrance. Two buoys are moored on the southwestern side of the channel about 400 and 950 yards west-northwestward of Stora Korssten.

Directions for Svartklubben and Jössan Entrances.—Vessels should approach Svartklubben Entrance with Svartklubben Light bearing between 247° and 342° and, when 1 mile from it, should bring the lights on Gåssten in range 320° . This range leads about 200 yards northeastward of Svartklubben Light, passes southwestward of the three spar buoys marking the shoals lying southwestward and westward of Måssten, northeastward of the spar buoy marking the northwestern end of the reef extending from Svartklubben, and northeastward of a shoal awash, marked by a spar buoy, and lying $9/10$ mile farther northwestward.

Råstensudde Light open southwestward of Stångskär leads southwestward of the shoals extending from Måssten.

If proceeding to the anchorage west-northwestward of Svartklubben, pass northward and westward of the spar buoy marking the northwestern end of the reef extending from Svartklubben, taking care to avoid two unmarked shoals, with depths of $3\frac{1}{2}$ and $1\frac{1}{2}$ fathoms, located about 400 and 600 yards westward of the spar buoy.

When passing either southwestward or northeastward of Getryggen, be guided by the buoys. Gåssten range lights lead through the southwestern reach. To pass on the northeastern side of Getryggen, leave the

Gåssten range when nearly abeam of the buoy marking the shoal awash, altering course to the right and thence to the left to round Getryggen. Bring the light beacons westward of Gåssten range lights in range 296° and steer on this range through the narrow part of the channel between Getryggen and the islet to the northeastward; thence continue through the fairway, being guided by the lights and buoys.

If proceeding to the anchorage in Gåssten Redd, when about 500 yards southeastward of the front light of the Gåssten range, alter course to the westward and steer for the anchorage, taking care to avoid the reef, marked by a plain spar buoy, that extends northwestward from the islet westward of Stångskär.

Vessels approaching Jössan Entrance should, with the aid of Understen Light and Svartklubben Light, pick up Jössan Light in range 294° with Tolvöreggrund Light before Svartklubben Light is obscured by Måssten. This range leads through the entrance and thence through the fairway to a position about 900 yards southeastward of Jössan Light, where course should be altered to the right to round the light to the northeastward. Rejoin the track about 700 yards northwestward of Jössan Light and continue northwestward to the intersection with the track from Svartklubben Entrance (sec. 6C-8).

LOADING PLACES AND APPROACH CHANNELS

6C-9 Singöfjärden is the enclosed water area westward of Singö and Fögdö. Extending westward from it are Raggaröfjärden and Galtfjärden. Smaller inlets lead off from these fjords. Many islets and dangers are in this area; those lying near the channel fairways are marked by buoys.

Herrängen, Hallstavik, Skärsta, Hargshamn, and Östhammar are loading places

situated in the inlets southwestward, westward and northwestward of Singö. The outer parts of the approach channels leading to them are the previously described Singösund, Svartklubben Entrance, and Jössan Entrance. Väddö Kanal and the western harbor of Grisslehamn (sec. 6A-8) are approached through the southern part of Singöfjärden.

Pilots for any of the places in these fjords may be obtained at Svartklubben or Öregrund (sec. 6D-7).

6C-10 Channels.—Three separate approach channels branch off from the main channel connecting Svartklubben Entrance and Öregrundsgrepen, lead southward into Singöfjärden, and meet at a position between Ramsan and Slätön, two islands off the western side of Singö. A draft of $24\frac{1}{2}$ feet can be taken into the fjord.

Lighted aids for these approach channels include Råstensudde Light, Halvvägen Light, about $1\frac{1}{2}$ miles southwestward, and Lammskärshällan Light and Slätö Light, located, respectively, about $\frac{1}{2}$ mile west-northwestward and $1\frac{1}{4}$ miles southwestward of Halvvägen Light. A beacon stands on the northeastern side of Höggrund in a position about 2 miles northwestward of Råstensudde Light. Buoys mark some of the dangers that lie adjacent to the channel fairways.

One of the channels leads through Ellaströmmen, the passage between the northwestern side of Singö and Långgrundet and Sjalgrund to the northwestward. A mid-channel shoal, marked by spar buoys, divides the channel. The deeper southern branch is suitable for vessels with a draft of $11\frac{1}{2}$ feet. From a position in the main channel about 200 yards northward of Råstensudde Light, this channel trends southwestward through Ellaströmmen for about 1 mile, thence south-southwestward for about $1\frac{1}{2}$ miles, passing between Lammskär, Lammskärshällan Light, and the buoy-marked shoals lying up to 1,100 yards southward of that light, on the west,

and Halvvägen Light and the buoy-marked shoals lying about 600 yards northward and 1,300 yards southwestward of the light, on the east.

The middle one of the above-mentioned three channels is the widest and the deepest. This channel, which is suitable for vessels with a draft of $24\frac{1}{2}$ feet, leads south-south-eastward for about $2\frac{1}{2}$ miles from a position in the main channel about 600 yards southward of the southern extremity of Enholmen, passes westward of Långgrundet, Själgrund and the northwestern side of Singö and eastward of Högggrund, Notskär, Björkgrund, and Lammskär, and joins the channel from Ellaströmmen between Lammskär and the shoal about 600 yards northward of Halvvägen Light.

The westernmost of the approach channels is very narrow in places and is available to vessels with a draft of $9\frac{1}{4}$ feet. It leaves the main channel from a position about 200 yards eastward of Hummelgården Light. This channel leads southeastward and southward for about $5\frac{1}{4}$ miles between the mainland and Falön, on the west, and many small islands, on the east, to the position between Ramsan and Slatön. Buoys mark the dangers which lie close to the fairway in places.

From the above channel junction position, the fairway extends southward an additional $1\frac{1}{3}$ miles to a position in the middle of Singöfjärden about 1 mile south-southeastward of Slätö Light, from which position vessels may steer for the various loading places. Vaddö Kanal and Ornefjärden are approached by steering southeastward and southward from this latter position for about 4 miles, passing through a narrow, buoyed channel among the islands in the southeastern part of Singöfjärden, to a position about $\frac{3}{4}$ mile southward of the southwestern end of Fögdö. Ornefjärden, at the head of which is the western harbor of Grisslehamn (sec. 6A-8), is entered about $\frac{1}{3}$ mile southeastward of this latter position. The entrance of Ortalaviken, the northern approach to Vaddö Kanal, lies about the same distance southward of that position.

Vessels entering the western harbor of Grisslehamn should steer 120° through the middle of Ornefjärden but close the southern shore in the inner part of the fjord.

6C-11 Vaddö Kanal and its approaches unite Singöfjärden with Stockholm Skärgård, which begins near the southern end of Björkö about 21 miles southward. Vessels with a draft of $8\frac{3}{4}$ feet can be taken through the canal.

The canal is 3.6 miles long between its northern entrance at the head of the narrow Ortalaviken and the southern entrance at the head of Bagghusfjärden. It extends from Granösund, in the south, where it connects Bagghusfjärden with Bagghusviken, and passes through two lakes, of which Storfjärden is the northern and larger. Buoys and lights mark the dredged channel. A swing bridge spans the canal at Bagghus, about 1 mile northwestward of Granösund, and also near the northern end of the canal at Elmsta about $2\frac{1}{4}$ miles farther north-northwestward. The latter bridge has a clear width of 31 feet. Vaddö Kanal is available for traffic by day and night, except when closed by ice or for repairs.

A ferry, worked on wires or chains, crosses the canal at Trästa, about $4\frac{1}{2}$ miles north-northwestward of the northern swing bridge.

Pilots for Vaddö Kanal may be obtained from Arholma, or Svartklubben.

Herräng, a loading place, is located on the southwestern shore of Singöfjärden about $2\frac{1}{2}$ miles southwestward of the southwestern end of Singö. Anchorage can be taken here in depths of 23 to 26 feet, sand and mud. Herränge has three wharves totaling 318 feet with depths of 5 to 14 feet alongside. There is a $1\frac{1}{2}$ -ton electric crane here. Tugs are available. Large vessels handle cargo at the anchorage, and small vessels use the wharves. Provisions and water are procurable. Steamer communication is maintained with Stockholm and other nearby ports. See section 1-6.

Range lights are shown from the shore at Herräng. A light is shown at Hensviksudde, about $\frac{1}{2}$ mile northwestward of Herräng.

The least depth in the fairway between the channel junction position in Singöfjärden and Herräng is 18 feet. The track leads generally southwestward for about 2 miles and passes between Rörskäret and Granskär and between the latter island and two islets to the westward.

6C-12 Edeboviken (Edbo Viken) ($60^{\circ} 08' N., 18^{\circ} 35' E.$), 2 miles westward of Herräng, is a narrow inlet extending about 5 miles southward. Källsön and Ormön, two islands, and other islands, islets, and rocks lie in the immediate approaches to Edeboviken. Ormöundet, in which lies the best approach channel, is available to vessels with a draft of 24 feet and lies westward of Ormön. The other approach channel, eastward of Källsön, is available to vessels with a draft of 9½ feet. A draft of 24 feet can be taken through Edeboviken to Hallstavik.

Lights are shown on both sides of Ormöundet.

Hallstavik and Skärsta are two towns located on the eastern and western sides, respectively, of Edeboviken near its head. The small harbor between the towns is divided into two parts by Stora Kangel. It is a loading place. In the northern part anchorage is available in 24½ feet, mud; the anchorage depth in the southern part is 13 feet, mud.

Lights in range $175\frac{1}{2}^{\circ}$ and buoys mark the channel leading through the principal approach and southward through Edeboviken.

A quay at Hallstavik is about 1,115 feet long and connected to the railroad system. Depths alongside the quay are about 24 feet. Two electric cranes, with capacities of 4½ and 20 tons, are available. A second quay is about 525 feet long and has 24½ feet alongside. One tug is available. Provisions, water, and a limited quantity of fuel oil are obtainable. There is a machine shop and a doctor in the town. Regular steamer communication is maintained with Stockholm and other nearby ports. See section 1-6.

Two lights, in range 270° , are located on Kälsholmen, an islet ½ mile north-north-

westward of the northern end of Ormön, and on Långöskär, an island ½ mile westward. This range marks a channel, available to vessels with a draft of 24½ feet, leading from a position about ½ mile southward of the channel junction position in Singöfjärden (sec. 6C-10), across the southern part of Galtfjärden, to a position ½ mile northward of Ormön, a total distance of 4 miles. A light buoy is moored on a $2\frac{3}{4}$ -fathom shoal northward of this range line about $2\frac{3}{4}$ miles eastward of Kälsholmen. A continuation of this track west-northwestward for about 2 miles, passing northward of Kälsholmen and Långöskär, leads to a position close off Hargshamn.

6C-13 Hargshamn is a loading place located about $7\frac{1}{2}$ miles westward of the southwestern end of Singö. Anchorage can be taken in the well-sheltered roadstead northeastward of the village in depths of from $3\frac{1}{2}$ to $6\frac{1}{2}$ fathoms, soft mud. There are a number of warping buoys in the roadstead. A quay at the village is about 620 feet long and has depths of $14\frac{1}{2}$ to $21\frac{1}{4}$ feet alongside. Close eastward is an offshore ore loading berth with depths of $29\frac{1}{2}$ feet between two dolphins spaced about 164 feet apart. Ore is loaded from an elevator at a rate of 230 tons per hour. One $1\frac{1}{2}$ -ton crane is available. Tracks connect with the general railroad system. Provisions and water are obtainable. Steamer communication is maintained with Stockholm and Östhammar. See section 1-6. Ice obstructs navigation from the first of January to the last of March.

Östhammar is a town and loading place located in the southwestern part of Östhammarfjärden about 12 miles northwestward of the southwestern end of Singö. The main approach channels lead northwestward from a position on the above-mentioned 270° track between Singöfjärden about $1\frac{1}{4}$ miles northward of Herräng and are suitable for vessels with a draft of 9 feet. They lead between the

islands Tvärnö and Värlingsö, thence through Länssundet, the narrow passage between the islands Fagerön and Länso, and thence into Östhammarfjärden through a dredged channel, which leads to the small pier.

Anchorage can be taken off Östhammar in a depth of 11 feet, mud and weed, poor holding ground. Vessels drawing more than 10 feet complete loading in the fjord between Fagerön and Tvärnö.

Two lights at Östhammar, in range 289°, lead to the pier.

Submarine high power cables (sec. 1-34) are laid across Länssundet; their landing places are marked by notice boards.

Östhammar has a population of about 7,500. It has a customs office. The small pier has depths of 7 to 10½ feet alongside. Provisions, water, and fuel oil are obtainable. A small tug is available. Minor repairs can be effected by a local machine shop. Regular steamer communication is maintained with Stockholm and other nearby ports. See section 1-6. A hospital is available.

ANCHORAGES

6C-14 Westward of Svartklubben.—See section 6C-7.

Gåssten Read.—See section 6C-7.

Herräng.—See section 6C-11.

Edeboviken.—See section 6C-12.

Hargshamn.—See section 6C-13.

Östhammar.—See section 6C-13.

Part D. ÖREGRUNDSGREPEN TO LÖVSTABUKTEN

6D-1 Örskär Light (60°32' N., 18°23' E.) stands on the northwestern side of the island of Örskär and marks the eastern entrance point of Öregrundsgrepen. A radio-beacon transmits from the light.

COAST—GENERAL

6D-2 Öregrundsgrepen is the sound formed between the western sides of Örskär and Gräsö and the mainland to the westward. Its entrance is 13½ miles wide between the northwestern side of Örskär and Björn, the rocky islet on the eastern side of Lövstabukten entrance to the northwestward. From Örskär Light Öregrundsgrepen extends southward about 12 miles to Öregrund Harbor at the head of the sound. The western side of the sound trends irregularly southward and southeastward for about 24 miles to Öregrund Harbor. Many dangers front the shores and extend through the middle of the sound. Buoyed channels lead among the dangers to a few small harbors and anchorages, which are located along the eastern and western shores. The shores are thickly wooded.

DEPTHS—DANGERS

6D-3 General depths in the entrance of Öregrundsgrepen are 13 to 16 fathoms. The main approach channel from the northward leading to Öregrund Harbor is available to vessels with a draft of 27½ feet. In the roadstead of Öregrund the depths are 7½ to 11 fathoms. Depths in Öregrund Harbor are 13 to 16 feet.

Dangers in the approach to Öregrundsgrepen northward of Örskär are described in section 6C-4.

Many of the islets and dangers in Öregrundsgrepen are steep-to. The western and middle parts of the sound are the most encumbered.

The outermost dangers in the entrance of the sound are: Jergrund, a shoal awash, marked on its northeastern side by a spar buoy, and lying about 1 mile eastward of Björn; Boliviagrund, a 3¾-fathom shoal, marked on its eastern side by a spar buoy, and lying about 2¼ miles eastward of Björn; Gungan, with a depth of 5 feet, marked on its

northwestern side by a spar buoy, and lying about $5\frac{1}{4}$ miles southeastward of Björn; Knuten, a $3\frac{1}{4}$ -fathom patch, marked by a spar buoy moored about 1,200 yards north-eastward of it, and lying about $7\frac{1}{4}$ miles southeastward of Björn and $6\frac{3}{4}$ miles west-northwestward of Örskär Light; Norra Östergrund, a $2\frac{1}{4}$ -fathom shoal, marked on its northeastern side by a spar buoy, and lying about $5\frac{1}{4}$ miles west-southwestward of Örskär Light; and two 4-fathom patches, lying about $\frac{1}{2}$ mile northeastward and $1\frac{1}{4}$ miles north-northeastward of Norra Östergrund. A spar buoy marks the northern of these 4-fathom patches, which lie near the approach track leading to Öregrund Harbor.

Other dangers adjacent to the buoyed channels are described with the related channels.

NAVIGATION

6D-4 From a position nearly 10 miles northward of Örskär Light (sec. 6C-5), a course of 273° for $11\frac{1}{2}$ miles leads over a least depth of 15 fathoms to a position about $3\frac{3}{4}$ miles northward of Björn Light (sec. 7A-1).

CURRENTS

6D-5 The set of the current in Öregrundsgrepen varies with the wind, but is usually southward; moderately strong velocities are attained.

COASTAL FEATURES—LANDMARKS

6D-6 Eastern side of Öregrundsgrepen.—Örskärssund separates Örskär from the northern end of Gräsö. Anchorage can be taken by vessels with local knowledge in the middle of the western part of this small sound in depths of $4\frac{1}{2}$ to 9 fathoms, sand and clay. Örskärssund is exposed to winds from north to west; it is usually icebound during January and February.

A rescue cruiser, equipped with radar, (sec. 6C-4) is maintained at Alskärsviken, about $2\frac{1}{2}$ miles southward of Örskär Light.

Fishing lights are shown at several small harbors on the western shore of Gräsö. Buoys mark some of the dangers in the approaches to these harbors.

Engelskagrund Light is located on the western side of Engelskagrund, a 1-fathom shoal lying about 4 miles south-southwestward of Örskär Light. The lighthouse sounds a fog signal and is fitted with a radar reflector.

Djursten Light stands on the western side of Gräsö about $9\frac{1}{2}$ miles southward of Örskär Light and about 2 miles northwestward of Öregrund Harbor. A fog signal is sounded from the lighthouse.

Bellonagrund, a 6-foot shoal on which a light stands, lies about $\frac{1}{4}$ mile westward of Djursten Light.

The main channel through Öregrundsgrepen leading to the head of the sound and Öregrund Harbor is entered close westward of Engelskagrund Light. It leads south-southeastward for about 6 miles to a position between Djursten Light and Bellonagrund Light, and thence southeastward for about 2 miles to a position close northward of Dummelgrund (sec. 6D-7). It can be used by vessels with a maximum draft of $27\frac{1}{2}$ feet.

Dangers adjacent to the fairway of the above-mentioned approach channel northward and northwestward of Bellonagrund include: Engelskagrund, mentioned above; Draggrund, a $1\frac{1}{2}$ -fathom shoal marked on its western side by a spar buoy, lying about $\frac{3}{4}$ mile north-northeastward of Engelskagrund Light; Grepensgrund, a $3\frac{1}{4}$ -fathom shoal marked on its northern side by a spar buoy, lying about $1\frac{1}{4}$ miles west-southwestward of Engelskagrund Light; Måsbodagrund, a $3\frac{1}{4}$ -fathom shoal, marked on its northern

side by a spar buoy, and lying about $2\frac{1}{8}$ miles north-northwestward of Djurston Light.

Buoys mark the other dangers near the channel which lie both northward and south-eastward of the narrows at Bellonagrund.

ÖREGRUND HARBOR

Position: 60°21' N., 18°27' E.
Depths: Roadstead, $7\frac{1}{2}$ to 11 fathoms.
 Harbor, 10 to 16 feet.
 Gräsögård anchorage, $5\frac{1}{2}$ to 14 fathoms.
 Piers, 9% to 14% feet.
Tidal rise: Negligible.

6D-7 Öregrund Harbor is located at the head of Öregrundsgrepen and about 15 miles northwestward of Svartklubben. The roadstead off the harbor lies between the mainland and the southwestern side of Gräsö. Facilities at Öregrund and Rörhamn are included in the harbor area.

Navigation.—Öregrund Harbor is approached from the southeastward by way of Svartklubben Entrance (sec. 9C-7) and from the northwestward through Öregrundsgrepen. For the navigational tracks leading through Södra Kvarken, thence westward to Öregrundsgrepen, see sections 6B-6 and 6C-5.

Navigation season.—Early April to January.

Winds.—With northerly gales a swell sets into the harbor.

Dangers — Depths. — Vesterhällan, which breaks, lies about $\frac{1}{2}$ mile southwestward of Djursten Light; spar buoys mark its northwestern and southeastern sides.

Dummelgrund is a rocky area, partly above water, lying close northeastward of the harbor entrance. Spar buoys mark the northeastern, southeastern, and southwestern sides, and a light is shown from a position near the northern edge of this area.

Depths in the roadstead northward of Öregrund Harbor are $7\frac{1}{2}$ to 11 fathoms. Inside the harbor off the town the depths are 13 to 16 feet. Gräsögård anchorage has

depths of $5\frac{1}{2}$ to 14 fathoms. The depths alongside the piers at Öregrund and Rörhamn vary from 9% to 14 feet.

Harbor.—Öregrund Harbor is small and is exposed to northerly winds. It has a masonry quay and a wooden pier.

Two pairs of range lights, located in and near the harbor, are aids for entering or leaving the harbor.

Anchorage is available in the roadstead off Öregrund Harbor in $7\frac{1}{2}$ to 11 fathoms, stiff mud, but vessels normally anchor in Gräsögård, off the town of Gräsö to the northeastward, where there is better shelter in from $5\frac{1}{2}$ to 14 fathoms, stiff mud. **Anchoring** is prohibited within 100 yards of a submerged compressed air line which is laid between Öregrund Harbor and Gräsö.

Pilots.—Öregrund is a pilot station; pilots meet vessels outside the harbor. Vessels from the southeastward obtain pilots at Svartklubben. Vessels from the northward can also obtain pilots from Gävle (sec. 7A-19), or from Skutskär (sec. 7A-7) by day.

Directions.—Approaching Öregrundsgrepen from the northward after having passed Argosgrund, steer for Engelskagrund Light, taking care to avoid Norra Östergrund. Leave Engelskagrund Light about $\frac{1}{4}$ mile to port and steer for Djursten Light on a course of 152° , but this may lead over a 28-foot shoal $\frac{2}{3}$ mile northward of Måsbodagrund. The belfry at Öregrund, just open eastward of Djursten Light and bearing 150° , will also lead in, but leads close northeastward of Måsbodagrund; therefore, when approaching this shoal, open the belfry a little more to the eastward. Pass Djursten Light at a distance of about 200 yards, or midway between that light and Bellonagrund. The beach near the light is steep-to. After passing Djursten Light keep from 200 to 300 yards off the Gräsö shore.

Öregrund, with a population of 2,000, is the town on the mainland about $11\frac{1}{2}$ miles southward of Örskär Light. The stone quay is 165 feet long and has depths of 9½ to 13 feet alongside. The wooden pier has depths of 12 to 14½ feet alongside.

Rörhamn lies about $\frac{1}{2}$ mile southeastward of Öregrund. It has a pier with depths of 9½ to 13 feet alongside. There is a small shipyard and foundry here and a marine railway with the following dimensions: extreme length, 328 feet; cradle length, 170 feet; draft on keel blocks, 8.9 feet forward and 16.4 feet aft; lifting power, 600 tons. A 20-ton crane is available.

Water is available alongside the quay at Öregrund. Coal and fuel oil may be procured. Provisions are obtainable. Regular steamer communication is maintained with Stockholm and other ports. See section 1-6. A ferry runs between Öregrund and Gräsö.

COASTAL FEATURES — LANDMARKS (Continued)

6D-8 Western side of Öregrundsgrepen.

— Stenskärgrund is a 1-fathom shoal, marked on its northeastern side by a spar buoy, lying $1\frac{1}{4}$ miles westward of Djursten Light. Helgasgrund, with a depth of $2\frac{1}{4}$ fathoms and marked on its southern side by a spar buoy, lies 2 miles west-northwestward of Djursten Light.

A buoyed channel, with a least charted depth of about 19 feet, leads for about $9\frac{1}{4}$ miles among the numerous dangers lying off the mainland between Kallrigafjärden and a position about $1\frac{1}{4}$ miles westward of Norra Östergrund.

Kallrigafjärden, entered about $4\frac{1}{2}$ miles northwestward of Öregrund, has a buoyed channel available to vessels with a draft of 17 feet. Anchorage can be taken in a depth of 16 feet, mud and clay, off Kallerö, a loading place on the western side of the fjord about $2\frac{3}{4}$ miles from the entrance; greater anchor-

age depths may be found farther outside. Pilots can be obtained from Öregrund. A quay at Kallerö is 360 feet long and has depths of 11 to 16 feet alongside. Tugs are available.

Bredbådan, a rocky islet about 7 miles west-southwestward of Örskär Light, is marked by a rectangular beacon.

Ängskärsklubb lies about $2\frac{3}{4}$ miles north-westward of Bredbådan. A light is shown on a rock close off its northern point.

Änskarshamn is a small loading place which is entered about 10 miles northwestward of Kallrigafjärden. The buoyed channel, which is suitable for a draft of 11 feet, leads to a small quay, with a depth of 11 feet alongside. Numerous shoals lie off the harbor entrance.

Sladahamn, about 3 miles north-northwestward of Änskarsklubb, is a small harbor of refuge. Two buoyed approach channels lead to the village of Draget inside the harbor. Local knowledge is required. The northern channel is available to vessels with a draft of 17 feet; the southern channel is suitable for a draft of 13 feet. The northeastern approach to the northern channel is indicated by two pole beacons on Bläckharen, one of the many rocks and shoals fronting the harbor entrance. A beacon is located on the southern side of this channel in a position about $1\frac{1}{4}$ miles northeastward of the above beacons.

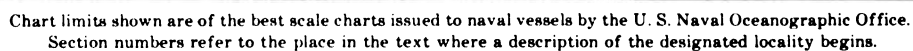
Rödhäll, the northern extremity of the mainland on the western side of Öregrundsgrepen, is located 2 miles southward of Björn.

ANCHORAGES

6D-9 Örskärssund.—See section 6D-6.

Öregrund Harbor.—See section 6D-7.

Kallrigafjärden.—See section 6D-8.



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CHAPTER 7

EAST COAST OF SWEDEN FROM LÖVSTABUKTEN TO JÄRNÄSUDDE

- Part A. Lövstabukten to Gåshällan
- Part B. Gåshällan to Hornslandet
- Part C. Hornslandet to Åstholmsudde
- Part D. Åstholmsudde to Högbonden
- Part E. Högbonden to Järnäsudde

Plan.—This chapter describes the greater part of the Swedish coast bordering on Bottnhavet, the southern portion of the Gulf of Bothnia. The arrangement of the coastal description is northward from Lövstabukten.

GENERAL REMARKS

7-1 The part of the east coast of Sweden described in this chapter is much indented and is fronted by many islands, rocks, and shoals. Lövstabukten is entered from Gävlebukten (Gävle Bight), a bight lying between Björn and Gåshällan, an islet about 30 miles northwestward. From the western side of Gävlebukten the general trend of the coast is northward and northeastward to Järnäsudde, a point lying about 175 miles north-northeastward of Björn. A number of outlying shoals are situated east-northeastward of Gävlebukten, the outermost of these dangers lying about 35 miles eastward of Gåshällan. Other dangers lie up to 11 miles offshore between Gåshällan and Järnäsudde.

The principal ports in this area are Gävle, Söderhamn, Hudiksvall, Sundsvall, Härnösand, and Ornsköldsvik. There are also several smaller ports, and many loading places in the various bays, harbors, fjords, and estuaries.

Note.—Some of the spar buoys in the area described in this chapter are equipped with radar reflectors.

ICE

7-2 Ice conditions prevail in the area covered by this chapter; for particulars and ice chartlets, see chapter 1.

NAVIGATION

7-3 Vessels bound northward from a position about 1 mile northeastward of Grundkallen Light Vessel (sec. 6B-4), and not intending to approach the coast southward of Norra Kvarken (sec. 9C-2), may steer a course of 012° for about $169\frac{1}{2}$ miles to a position about $1\frac{1}{2}$ miles southeastward of Sydostbrotten Light (sec. 9A-3). This track leads over a least depth of 33 fathoms, clears all dangers, and makes its closest coastal approach at the above-mentioned terminal positions.

CURRENTS

7-4 Along the Swedish shore of the Gulf

of Bothnia the general set of the current is southward in calm weather, with a tendency to set toward the land. The currents are much affected by the wind, a change in the current often preceding a storm by an interval of several hours to a day. For further particulars regarding currents, see chapter 1.

Part A. LÖVSTABUKTEN TO GÅSHÄLLAN

7A-1 Björn (Biörn) ($60^{\circ}38' N.$, $17^{\circ}59' E.$) is the northernmost islet of a group of islets, rocks, and shoals extending about $2\frac{1}{2}$ miles northward from Rödhäll, on the western side of the entrance to Öregrundsgrepen. Björn Light is shown on the eastern end of the islet. A fog signal is sounded. Another light is shown occasionally in a position on the coast about $2\frac{1}{2}$ miles south-southwestward of Björn Light and Fagelsundet Västtra Fishing Light, shown only when required, is situated about $\frac{1}{3}$ mile farther west-southwestward.

A narrow channel, with a least depth in the fairway of about 3 m (10 ft.), lies a short distance southward of Björn and connects Öregrundsgrepen with Lovstabukten, the bay entered westward of Björn. The channel is marked by range beacons and buoys.

COAST—GENERAL

7A-2 The entrance of Lövstabukten, on the southern side of Gävlebukten, lies between Björn and a point on the mainland about $10\frac{1}{2}$ miles westward. Lövstabukten is encumbered with many islets and dangers. The port of Gävle is situated at the head of a bight which comprises the southwestern part of Gävlebukten. A number of islands, rocks, and shoals lie in the approaches to Gävle. The western side of Gävlebukten,

northward of the approaches to Gävle, is fronted by numerous islands and dangers. The mainland and the larger islands are thickly wooded. The coastal indentations are much encumbered with dangers, and should not be entered without a pilot.

DEPTHS—OUTLYING DANGERS

7A-3 The depths in Gävlebukten are very irregular. All coastal dangers are within the 20-fathom curve.

Off-lying danger ($61^{\circ}15' N.$, $18^{\circ}27' E.$).—A depth of 9.1 m (5 fms.) lies about $12\frac{1}{2}$ miles northward of the northern edge of Osyra Banken. Two spar buoys and a lighted whistle buoy with a radar reflector mark this danger.

Campsgrund, a shoal with a least depth of 7.6 m ($4\frac{1}{4}$ fms.), lies about $5\frac{3}{4}$ miles northwestward of Björn Light. A spar buoy is moored on the northern side of the shoal.

Finngrunden (Finngrundet), consisting of two shoal banks separated by a deep-water channel, is situated off the entrance to Gävlebukten. Caution is necessary when navigating in the vicinity of these banks, as they are too far offshore for landmarks to be visible.

Östra Banken (East Bank), the outer part of Finngrunden, lies with its southern extremity about 21 miles northeastward of Björn. Near its southern edge is a group of shoals with a least depth of 1.5 m (5 ft.), and on the northern part of the bank is another group of shoals with a least depth of 3 m ($1\frac{3}{4}$ fms.). A spar buoy is moored in about 18.3 m (10 fms.) off the southern side of the bank. The eastern side of the shoalest part of this bank is marked by three spar buoys that are moored at intervals of about 2 miles apart.

Finngundet Light is located in about 18.3 m (10 fms.) of water about 4 miles eastward of the northern group of shoals on Ostra Banken.

Vastra Banken (West Bank), the western part of Finngunden, consists of several groups of shoals with a least depth of 0.6 m (2 ft.) on the northeastern part of the bank; they are marked with a lighted whistle buoy with a radar reflector and a spar buoy 1 1/2 miles north-northwestward and west-northwestward, respectively, from the 0.6 m (2 ft.) patch.

A 3 3/4-fathom shoal, marked on its southern and northern sides by spar buoys, lies about 4 1/2 miles northeastward of the 2-foot patch.

On the southern part of Västra Banken is a shoal, with a least depth of 1 3/4 fathoms, marked on its northeastern side by a spar buoy, and on its southwestern side by a spar buoy. A 4 3/4-fathom patch lies about 1 3/4 miles farther southward.

Vastra Banken Light Vessel has been withdrawn and Vastra Banken Light established in 60°53'N., 17°55 1/2'E. A fog signal is sounded at the light. A submarine cable extends from the light in a general southwesterly direction to Eggegrund.

Utknallen, a shoal with a depth of 6.8 m (3 3/4 fm.), lies about 4 miles westward of Vastra Banken Light Vessel. It is marked on its eastern and western sides by spar buoys.

Blockbanken, lying about 7 1/4 miles north-eastward of Eggegrund Light (sec. 7A-9), has a least depth of 6 m (3 1/4 fms.). The 6 m (3 1/4 fm.) patch is marked on its northern and southern sides by spar buoys.

Petres Bank, a shoal of gravel with a least depth of 2.5 m (1 1/4 fm.), lies about 2 3/4 miles north-northeastward of Eggegrund

Light; it is marked on its eastern and southern sides by spar buoys.

Lövgrunds (Löfgrund) Rabbar, about 5 1/2 miles northward of Eggegrund Light, consists of several shoal heads, some of which are awash. The surrounding depths increase rapidly, especially on the northwestern side. Lövgrunds Rabbar Lighted Whistle Buoy, with a radar reflector, is moored east-northeastward of the shoals and about 6 miles northward of Eggegrund Light. This light buoy is lit from July 15 to December 1. The group of shoals is marked on its eastern, northern, western, and southwestern sides by spar buoys.

A number of other shoals with depths of 8 to 18.3 m (4 1/4 to 10 fms.) are scattered throughout the area in which the above shoals lie.

Coastal dangers are described with the related features. Dangers in the approaches to Gävle are described in section 7A-9.

NAVIGATION

7A-4 Vessels bound northward on the coastal track and having arrived at a position about 3 3/4 miles northward of Björn Light may steer a course of 346° for about 52 1/4 miles to a position about 1 3/4 miles eastward of Agö Light (sec. 7B-3). This track leads over a least depth of 14.6 m (8 fms.) and about 1 mile westward of a 9.1 m (5 fm.) patch near the southern end of Vastra Banken. It passes about 1 mile westward of Vastra Banken Light Vessel and makes its closest coastal approach off Agon (sec. 7B-3).

CURRENTS

7A-5 Near Finngrunden the current usually sets southeastward or east-southeastward, and frequently attains a rate of 1 knot. The direction varies with sudden changes of wind and weather. In the approaches to Gävle the current is weak and its direction is variable.

COASTAL FEATURES—LANDMARKS

7A-6 Lövstabukten (Löfsta Bay).—This bay is encumbered with numerous islets and dangers, and entry should not be attempted without a pilot. Knifven Beacon, surmounted by a cross, stands on an islet about $8\frac{1}{2}$ miles west-southwestward of Björn Light. A light is shown during the fishing season from an islet lying close eastward of the western entrance point of Lövstabukten. A motor lifeboat is stationed at Fågelsundet, about $2\frac{3}{4}$ miles southwestward of Björn Light. Ice usually obstructs navigation in Lövstabukten from December to April.

Fagerviken, a loading place on the eastern side of Lövstabukten, is approached through a channel available to vessels with a draft not exceeding 14 feet. Two range lights, shown from beacons, lead through the outer part of the channel which is marked by spar buoys. An 8.2 m (4 $\frac{1}{2}$ fm.) patch, marked by a spar buoy, lies close eastward of the approach channel about 4 $\frac{1}{3}$ miles north-northeastward of the front range light. There is anchorage in the outer harbor in a depth of 4.2 m (14 ft.), clay mixed with rubble, and in the inner harbor in a depth of 4.2 m (14 ft.), mud. The harbor is sheltered from all winds. A quay about 546 feet long has a depth of 4.2 m (14 ft.) alongside and a small pier has a depth of 2.9 m (9 $\frac{3}{4}$ ft.) alongside. Provisions and a limited amount of water and fuel oil are available. Pilots may be obtained from the pilot station for Gävle.

Karlholm is a loading place on the western shore of Lovstabukten, near its head. A buoyed channel, available to vessels with a draft not exceeding 18 feet, leads to the outer harbor in which there is anchorage in

a depth of 6.8 m (22 $\frac{1}{2}$ ft.), clay. Range beacons indicate the approach channel. Vessels at anchor secure their sterns to a small quay, alongside which is a depth of 5.8 m (19 ft.). Vessels with not more than 17 $\frac{1}{4}$ -foot draft can enter the inner harbor where a quay has a depth of 2.5 m (8 $\frac{1}{2}$ ft.) alongside. On the latter quay is a 2 $\frac{1}{2}$ -ton crane. Tugs are available. Provisions, in limited amounts, and water can be obtained.

The coast between the western entrance point of Lovstabukten and the town of Gävle, about 13 miles westward, is covered with trees. About midway is the harbor of Skutskar-Harnas, close eastward of which is the mouth of Dalaälven (River Dal). The depth in the entrance of this river is 2 m (1 fm.). Between the western entrance point of Lovstabukten and Bilskaten, a point lying nearly 3 $\frac{1}{2}$ miles west-northwestward, the coast is fronted by shoals and reefs. A light is shown on Bilskaten during the fishing season. A reef, on which are a rock above water and one awash, extends about 1 $\frac{2}{3}$ miles northeastward from Bilskaten; a spar buoy marks the outer end of the reef. Flatbotten, a group of shoal patches having a least depth of 3.9 m (2 $\frac{1}{4}$ fm.), lies close northeastward of the reef, and is marked on its southwestern side by a spar buoy. During the fishing season a light is shown from a position about 2 miles southwestward of Bilskaten.

Vaktaren, a detached 7.8 m (4 $\frac{1}{4}$ fm.) patch marked by a spar buoy with a radar reflector, lies about 3 $\frac{1}{2}$ miles northeastward of Bilskaten.

SKUTSKAR—HARNAS

Position: 60°39'N., 17°24'E.
 Depths: Entrance channel, 8.2 m (27 ft.)
 Outer harbor, 5.8 to 7.6 m (19 to 25 ft.)
 Inner harbor, 3.4 to 7 m (11 $\frac{1}{2}$ to 23 ft.)
 Berths, 3.9 to 7.6 m (13 to 25 ft.)
 Tidal rise: Negligible.

7A-7 Skutskär-Harnäs (Skutskär Hamn) is a small but well-protected harbor which serves the towns of Skutskär and Harnäs, standing, respectively, on the southeastern and western sides of the harbor.

Navigation.—Vessels bound for Skutskär-Harnäs, and having arrived at a position about $3\frac{3}{4}$ miles northward of Björn Light, may steer a course of 273° for about $12\frac{1}{2}$ miles to a position about 1 mile southward of Eggegrund Light, thence a course of 236° for about $5\frac{1}{2}$ miles to a position about $\frac{1}{2}$ mile north-northeastward of the harbor entrance. These courses lead over a least depth of $6\frac{1}{2}$ fathoms, and pass about $\frac{1}{4}$ mile northward of Campsgrund and $\frac{1}{3}$ mile northwestward of a 5-fathom patch lying west-northwestward of Bilskaten.

Ice usually closes the harbor to navigation from the beginning of January to the middle of April.

Depths.—The harbor of Skutskär-Harnäs has a maximum depth of $29\frac{1}{2}$ feet immediately inside the entrance. The outer harbor has depths of $19\frac{1}{2}$ to $25\frac{1}{4}$ feet at the anchorage and 17 feet alongside berthing spaces. The inner harbor has depths of $11\frac{1}{2}$ to 23 feet alongside.

Landmarks.—The tower and chimneys of the wood pulp factory at Skutskar are clearly visible from seaward, especially from northward.

Navigational aids.—Skutskär Light is shown on the head of the western breakwater. Three pairs of range lights lead into and through the harbor to its eastern end. Spar buoys mark the entrance and harbor channels, and the dredged area in the harbor.

Harbor.—The harbor is sheltered on its northeastern side by a peninsula from the western extremity of which a short breakwater projects west-northwestward. Another breakwater extends eastward from the western side of the harbor. A $2\frac{1}{4}$ -fathom shoal, marked by a spar buoy with a radar reflector, lies immediately northward of the entrance between the breakwater heads.

A spar buoy moored a short distance northeastward of the harbor entrance marks a $3\frac{3}{4}$ -fathom shoal.

The channel leading through the entrance and into the dredged area of the harbor is

197 feet wide. A channel extending southward from the entrance divides into two branches, one leading toward Skutskär and the other toward Harnäs. Vessels unable to load a full cargo in the harbor can complete loading at an anchorage in depths of 8 or 9 fathoms, sand and stones, about $\frac{1}{2}$ mile northeastward of Skutskär Light.

Pilots.—Vessels approaching Skutskär may obtain pilots from Oregrund, Gävle, or Bonan (sec. 7A-19). For general information regarding pilotage in Swedish waters, see section 1-25.

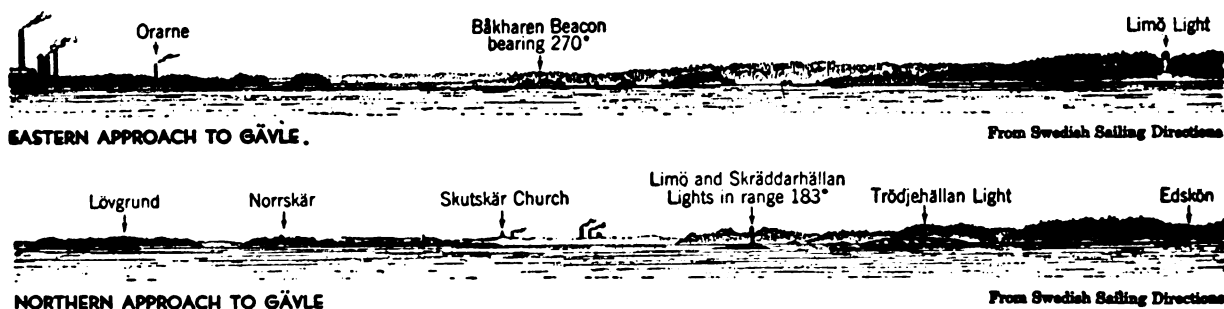
Directions.—Approaching the harbor entrance, steer for Range Lights Nos. 1 and 2, located on the southern shore of the harbor and the westernmost of the three pairs of range lights, in range 216° . This range leads eastward of the $2\frac{1}{4}$ -fathom shoal off the entrance and into the channel between the heads of the breakwaters. Thence, proceed to Skutskär or Harnäs, being guided by the spar buoys and range lights.

7A-8 Skutskar, on the southeastern side of the harbor, has a population of about 6,000. The principal exports are wood pulp, wooden goods, and resin. A customs station in the town is open during the navigation season. The outer harbor, immediately south of the western breakwater, consists of an anchorage in 3 to 4 fathoms with stern moorings to concrete chests fitted with bollards and westward thereof an oil wharf 170 feet in length with 17 feet alongside. In the southern part of the harbor, a pulp mill has an aggregate quayage of 2,444 feet with 13 to 25 feet alongside. A $5\frac{1}{2}$ -ton crane is available. The inner, or eastern, harbor has depths of $11\frac{1}{2}$ to 23 feet, mud, and a concrete quay about 684 feet long with 23 feet alongside.

In Skutskär and Harnäs provisions can be obtained. Water is supplied by water boat. Tugs are available. Minor repairs can be made. Both towns are connected to the general railroad system.

APPROACHES TO GÄVLE

7A-9 Eggegrund (Eggegrundet) is a barren sandy island lying about $13\frac{1}{2}$ miles west-northwestward of Björn Light. It is surrounded by a narrow reef, and within $\frac{1}{2}$ mile of its northern side are three patches



with depths of $3\frac{3}{4}$ to $4\frac{3}{4}$ fathoms. A **submarine cable** extends southward from Eggegrund to the mainland. Hansbådan, with a least depth of 3 fathoms, and Grussankan, with a depth of $5\frac{1}{2}$ fathoms, lie about 1 mile east-northeastward and $1\frac{1}{2}$ miles east-southeastward, respectively, of the eastern end of Eggegrund. A **spar buoy** is moored on the northern side of Hansbådan and a **spar buoy** is moored on the southern side of Grussankan.

Eggegrund Light ($60^{\circ}44' N.$, $17^{\circ}34' E.$) is shown on the eastern end of the islet. A **fog signal** is sounded and a **radiobeacon** transmits.

Skälstenarne (Skalsten), two small islets surrounded by reefs and rocks awash, lie about $1\frac{1}{3}$ miles westward of Eggegrund. Gråskälsbådan (Graskälsbade), an islet also surrounded by reefs, lies about $\frac{3}{4}$ mile farther westward. Several shoals lie between Skälstenarne and Gråskälsbådan, and a 4-fathom patch lies about $\frac{1}{3}$ mile westward of the latter.

Limön, a high, wooded island, lies about 5 miles westward of Eggegrund. **Limö Light** is shown on the island. Two **beacons** stand northeastward of the light and another **beacon** stands on the eastern end of the island. Several islets, and extensive shoals and reefs lie within a distance of about 1 mile northwestward, westward, and southwestward of Limön. A 2-fathom patch, marked by a **spar buoy**, lies about $\frac{1}{2}$ mile southward of the eastern end of the island. A $3\frac{1}{2}$ -fathom patch lies close eastward of

the 2-fathom patch, and farther eastward is a $4\frac{1}{2}$ -fathom patch. Kalvagnsgrund, a $2\frac{1}{4}$ -fathom patch marked on its southern side by a **spar buoy**, lies about $\frac{1}{2}$ mile southward of Limön. A reef awash, marked by a **spar buoy**, lies about $\frac{1}{3}$ mile northward of the eastern end of Limön.

Orarne, a low, wooded island, lies about 1 mile south-southwestward of Limön. It is surrounded by reefs and shoals, and adjacent to it are a number of islets. A $2\frac{1}{2}$ -fathom patch lying about $1\frac{1}{4}$ miles eastward of Orarne is marked by a **spar buoy**. A $4\frac{1}{4}$ -fathom patch marked by a **spar buoy** lies about $2\frac{1}{4}$ miles eastward of Orarne.

Lövgrund (Löfgrund), a low wooded island, lies about $2\frac{3}{4}$ miles west-northwestward of Eggegrund. It is fringed by a reef, and several detached dangers lie between it and the islets of Gråskälsbådan and Skälstenarne. Northward and northeastward of Lövgrund are other detached dangers with depths of 1 to 5 fathoms, and a small islet lies about $\frac{1}{3}$ mile eastward of its northern extremity. Norrgrund, a 6-foot patch lying close northward of the northern point of the island, is marked on its northern side by a **spar buoy**, and a shoal with a least depth of 2 fathoms, lying about $\frac{1}{2}$ mile west-northwestward of the same point, is marked on its western side by another **spar buoy**. Each buoy is equipped with a **radar reflector**.

Vitgrund (Hvitgrundet) and **Norrskär**, two islets fringed by shoals, reefs, and rocks awash, lie about $1\frac{1}{2}$ and $1\frac{3}{4}$ miles, respec-

tively, northwestward of Lövgrund. A beacon with a radar reflector stands close northward of Norrskär. Foul ground, through which is a channel marked by spar buoys, lies between Vitgrund and the mainland westward. A $2\frac{3}{4}$ fathom patch, marked by a spar buoy, lies about $\frac{1}{2}$ mile southward of Vitgrund; a shoal with a least depth of 4 feet lies close northward of this patch. Purrutsgrund, lying about $1\frac{1}{2}$ miles east-northeastward of Norrskär, has a depth of 2 fathoms, and is marked on its eastern side by a spar buoy with a radar reflector. A number of other shoal patches are in this vicinity.

Skräddarhällan Light is shown on Skräddarhällan, a small islet lying nearly 1 mile westward of Vitgrund. **Elofsgrund Light Buoy**, painted red, is moored on the eastern side of the fairway in the passage between Vitgrund and Skräddarhällan.

Edskön, a large island lying about 2 miles northwestward of Vitgrund and close to the mainland, is rather high and wooded. A beacon stands on the southeastern point of Edskön and another beacon stands in the bay southward of that island. These beacons, in range with the beacon standing close northward of Norrskär, indicate, respectively, the southern and northern limits of the approach between Petres Bank and Hansbådan. **Edsköklubb**, an islet close off the eastern end of Edskön, is also high and wooded, and has a light-colored, rocky coast.

Trödjehällan Light is shown on Trödjehällan, a rock 12 feet high, lying about $\frac{1}{2}$ mile northward of Edsköklubb. A group of reefs and detached shoal patches lies eastward and northeastward of Edsköklubb and Trödjehällan, and is separated from them by a channel. **Sidenvallsgrund** and **Hällgrund**, lying near the edge of the channel, are marked on their western sides by spar buoys. **Klubbgrund**, with a least depth of 17 feet, and **Hundra** an 11-foot patch lie about $1\frac{1}{2}$ miles east-northeastward of Trödjehällan and at the northern end of the group of dangers; it is marked on its northern side by a spar

buoy. Numerous other unmarked dangers lie on both sides of the track in the northern approach to Gävle.

7A-10 Channels.—**Yttre Fjärden**, the roadstead of Gävle, can be entered from seaward by two channels. **Båkharsrännan**, the southern channel, has a least depth of $14\frac{1}{2}$ feet and lies between Orarne and Limön. **Holmuddsrännan**, the northern channel, is dredged to a depth of 26 feet and lies close southward of Holmudden, a point on the mainland about $1\frac{1}{2}$ miles northwestward of Limon Light. The maximum draft permitted in this channel is 24 feet 9 inches (1966). There are three approaches to Holmuddsrännan. One, for vessels of any draft, passes between Graskälsbådan and Limon. Another, for winter use, passes between Petres Bank and Hansbådan, and is available to vessels with a draft not exceeding 25 $\frac{1}{2}$ feet. A third approach, also for vessels with a draft not exceeding 25 $\frac{1}{2}$ feet, leads between Lovgrunds Rabbar and the shoals east-northeastward of Trödjehällan, thence eastward of Purrutsgrund, and between Vitgrund and Lovgrund.

Caution.—A defensive area, through which surface navigation is permitted but in which anchorage and fishing are prohibited due to the possible presence of bottom mines, extends eastward from Yttre Fjärden and lies in the approaches to Gävle. Foreign vessels are cautioned that while navigating through the area they must remain within the generally used approach channels.

Measured distance.—A measured distance of 2.3493 miles on a course of 088° — 268° is established eastward of Limön. The distance is divided into two parts, the length of the western section being 0.979 mile and the eastern, 1.3703 miles. The course is defined by Limö Light and a beacon on the eastern end of Limön in range bearing 268° . The western end of the distance is indicated by a beacon on Gräskälsbådan in range 358° with a beacon on Käringen, an islet lying about $\frac{1}{3}$ mile eastward of the northern extremity of Lövgrund. The division between the two parts is indicated by two range beacons on Skälstenarne. The eastern end

of the measured distance is indicated by two range beacons on the western end of Eggegrund.

GÄVLE

Position: 60°41' N., 17°10' E.
Depths: Båkharsrännan, 14½ feet.
 Holmuddsrännan, 26 feet.
 Yttre Fjärden, 6 to 8 fathoms.
 Mellanskansrännan, 26 feet.
 Channel through Inre Fjärden, 17 feet.
 Berths, 9 to 26 feet.
Tidal rise: Negligible.
Port plan: See section 7A-21.

7A-11 Gävle is located at the mouth of Gävleån. The outer limit of the port is defined by a line drawn south-southwestward from Utvalnäsudde, a point lying about 2¼ miles northward of Limö Light, through Båkharen to the southern shore. The port consists of Yttre Fjärden, in which are the outer harbor and road, and Inre Fjärden, the inner harbor.

NAVIGATION

7A-12 Eastern approach.—Vessels bound to Gävle from eastward may proceed to a position about 1 mile southward of Eggegrund Light as directed in section 7A-7. From this position they may continue toward either of the two entrances to Yttre Fjärden as directed in section 7A-20.

Northern approach.—Vessels bound to Gävle from northward may leave the coastal track at a position about 1¾ miles eastward of Agö Light (sec. 7B-3) and steer a course of 180° for about 22½ miles to a position about 5¾ miles eastward of Storzungfrun Light (sec. 7B-3), thence a course of 195° for about 17½ miles to a position about 1½ miles eastward of Iggöskaten, the northeastern point of Iggön (sec. 7A-22). This track leads over a least depth of 6 fathoms, and about ½ mile eastward of patches with depths of 4¼ and 5 fathoms.

From the position off Iggön, Holmuddsrännan may be approached by either the inner or outer routes as directed in section 7A-20.

ICE

7A-13 Ice obstructs navigation from the end of January to the end of March, but the harbor is usually kept open by ice breakers.

WATER LEVEL

7A-14 The water level at Gävle ranges from about 1 foot above to 0.7 foot below mean sea level. Northeasterly gales increase the height of the water level.

CURRENT

7A-15 In Yttre Fjärden there is a slight current setting eastward.

DEPTHS

7A-16 The least depth in Båkharsrännan is 14½ feet, and in a channel branching northwestward from Båkharsrännan the least depth is 9 feet. Holmuddsrännan is dredged to a depth of 26 feet; a branch channel trending southwestward from the main channel has a least depth of 21 feet. In Yttre Fjärden the depths in the road is 6 to 8 fathoms, and at the southwestern end, Mellanskansrännan, a channel leading to the southwestern quay at Fredriksskans, is dredged to a depth of 26 feet. There is a depth of 26 feet in the channel leading to the southeastern and eastern quays at Fredriksskans. The channel from Mellanskansrännan to the quays in Inre Fjärden has a depth of 16½ feet. The depths at the berths are described in section 7A-21.

The maximum draft permitted in the northern dredged fairway is 24 feet 9 inches (1966).

HARBOR

7A-17 Entrance channels.—Båkharsrännan, the southern entrance channel to Yttre Fjärden, leads northward of Fyrkantgrund, or 6-foot patch, and southward of Båkharen, a low lying rock close northeastward of the western end of the channel. The channel is not well buoyed.

Holmuddsrännan, the northern entrance channel, leads into Yttre Fjärden between Holmudden and the reefs extending northwestward from Limön. Abreast of Holmudden a branch channel trends southwestward from the dredged channel, being separated from it by shoals. Spar buoys mark both the main and branch channels.

Caution.—Holmuddsrännan is a defensive area, surface navigation is permitted through the area but anchoring and fishing are prohibited due to the possible presence of bottom mines. During thunderstorms, vessels navigating in this area do so at their own risk.

Yttre Fjärden (Outer Fiord).—Yttre Fjärden is sheltered by Limön and Orarne, with their adjacent islets, reefs and shoals. Herosgrund, lying near the middle of Yttre Fjärden, has a least depth of 16 feet; it is marked on its northwestern side by a light buoy and on its southern side by a spar buoy.

Several shoal patches, one of which is marked by a spar buoy, lie between Herosgrund and the northwestern shore of Yttre Fjärden. A 2 3/4-fathom shoal, marked on its southern side by a spar buoy, lies close to the track about 2/3 mile north-northeastward of Herosgrund. A 12-foot patch, marked on its northern and western sides by spar buoys, and a 24-foot patch, marked on its northern side by a spar buoy, lie respectively, about 1/2 mile northward and 2/3 mile north-northwestward of the head of the pier at Karskär.

Karskär, a loading place on the southern side of Yttre Fjärden, is approached through a buoyed channel available to vessels with a draft not exceeding 26 feet. There is a pier and a quay, for the descriptions of which, see section 7A-21.

Kastet, a loading place about 1/2 mile northwestward of Karskär, is approached through a buoyed channel available to vessels with a draft not exceeding 29 feet. There is a pier and a quay, for the description of which, see section 7A-21.

Engesberg, a loading place on the northern side of Yttre Fjärden, has a small quay which is approached through a buoyed channel.

Fredriksskans.—The outer harbor of Gävle is at Fredriksskans on the northern side of the entrance to Inre Fjärden. This harbor is protected on its eastern side by a breakwater. Dredged channels lead to the quays bordering Fredriksskans. Traffic signals are displayed on the eastern quay. Lights in range 329° are located about 1/2 mile northward of Fredriksskans and mark the eastern limit of the 26-foot dredged area fronting the quay.

Bomhus, a loading place on the southern side of the entrance to Inre Fjärden, has a wharf for the use of lighters.

Inre Fjärden.—A channel leads from Mellanskansrännan to the quays at Gävle. Mellanskansrännan and the channel through Inre Fjärden are marked by light buoys, spar buoys, and dolphins. Quays border both sides of Gavleån, and northward of the river entrance is Nyhamn, a quayed basin. A canal entered northward of Nyhamn has quays for small vessels on both sides.

A lifesaving station with rescue craft and line-throwing apparatus is maintained at Gävle.

Depth gauges are located near Holmudden and at Fredriksskans Light.

Navigational aids.—Bönan Light is shown on an islet lying near the coast, about 1 3/4 miles northwestward of Limö Light. A light is shown on Ytterriskan on the eastern side of the entrance of Holmuddsrännan. Four lights, two on either side, mark Holmuddsrännan. A fishing light is shown at Lugnet, southward of Orarne. A light is shown on the outer end of the pier at Karskär. Långharen Light stands on the head of a jetty eastward of Karskär. Fredriksskans Light is shown from a structure standing close southward of the southern end of the breakwater at Fredriksskans. Two range lights and one other light mark the channel to the quays at Gävle.

Buoys marking the approaches and channels leading to Gävle are placed in accordance with the uniform system.

7A-18 Anchorages—Prohibited anchorages.—In Yttre Fjärden vessels can anchor in 6 to 8 fathoms, mud and clay, keeping clear of the channels. The quarantine anchorage, marked by buoys, is situated southwestward of Granskär, an islet in the northeastern part of Yttre Fjärden.

Vessels can anchor in Gråbergsredde, northward of the northeastern entrance to Holmuddsrännan. This anchorage has good holding ground in 9 to 11 fathoms, sand and clay, but is exposed to eastward.

Anchorage is prohibited in an area in Yttre Fjärden lying between the limits of the white sector of Fredriksskans Light. These limits are indicated by a white daymark on Sörgrund, close westward of Bomhus, in range with Fredriksskans Light, and another white daymark on the roof of a warehouse in Bomhus in range with the same light. Anchoring is also prohibited on the bearings of any of the ranges.

PILOTS

7A-19 Pilots can be obtained from Gävle and Skutskär or, when weather conditions force the pilot vessel off its station south of Eggegrund, from Bönan. Vessels coming from the south can obtain pilots at Öregrund (sec. 6D-7). For general information regarding pilotage in Swedish waters, see section 1-25.

DIRECTIONS

7A-20 Båkharsrännan from eastward.—To enter Yttre Fjärden through Båkharsrännan, having passed between Eggegrund and Flatbotten, steer for the beacon on Båkharen,

bearing 270°, passing southward of Kalvagnsgrund, and thence through the buoyed channel northward of Fyrkantgrund.

Holmuddsrännan from eastward.—From a position about 1 mile southward of Eggegrund, steer for Limö Light, bearing 271°. When Lövgrund opens westward of Gråskälsbådan steer for Bönan Light, bearing about 293°, round the spar buoy marking the northern side of Ytterriskan, a reef lying about 1½ mile southeastward of Bönan Light, and proceed through Holmuddsrännan, being guided by the lights and buoys marking the channel. The courses steered toward Limö and Bönan Lights lie, respectively, within the white sectors of those lights.

A winter route, marked by lights and other navigational aids, passes between Petres Bank and Hansbådan. The limits of this fairway are defined by the beacon close northward of Norrskär (sec. 7A-9) in range with, respectively, the beacon on Edskön (sec. 7A-9) and the one in the bay southward of that island. When Eggegrund Light is bearing 249° and distant about 3¼ miles, vessels proceeding to Holmuddsrännan by this route should steer for the beacon close northward of Norrskär, on a course of 284°. When the northern point of Lövgrund is abeam, they should steer for Limö Light, bearing 219°. The limits of the fairway between Lövgrund and Vitgrund are defined by Limö Light in range with, respectively, each of the two beacons standing on Limön (sec. 7A-9), northeastward of the light structure. When the southern point of Vitgrund bears about 332°, they should steer for Bönan Light on a heading of 257° and proceed through Holmuddsrännan as previously directed.

Holmuddsrannan from northward.—Approaching Holmuddsrannan from the northward, and having arrived at a position eastward of Iggon, steer for Eggegrund Light on a course of about 149°. When Limö Light bears 219°, steer toward it on that bearing, passing about 1/4 mile southeastward of the spar buoy marking Purutsgrund and northeastward of the spar buoy marking Norrgrund. When the southern end of Vitgrund bears about 332°, steer for Bönan Light on a course of 257°, and proceed through Holmuddsrannan as previously directed. The courses steered toward Eggegrund, Limö, and Bönan Lights lie respectively, within the white sectors of those lights.

Inre Fjärden.—If bound for the quays at Gävle, pass southward of Fredriksskans Light and proceed through Mellanskansrannan and Inre Fjärden, being guided by the lights, buoys, and dolphins marking the channel.

FACILITIES

7A-21 Gävle, situated on both sides of Gavleån, is an important center of commerce and industry with a population of about 53,000. Wood, wood pulp, paper, iron ore, and iron and steel products are exported. Among the principal imports are grain, coal, coke, petroleum products, machinery, and colonial produce. There is a customhouse at Gävle.

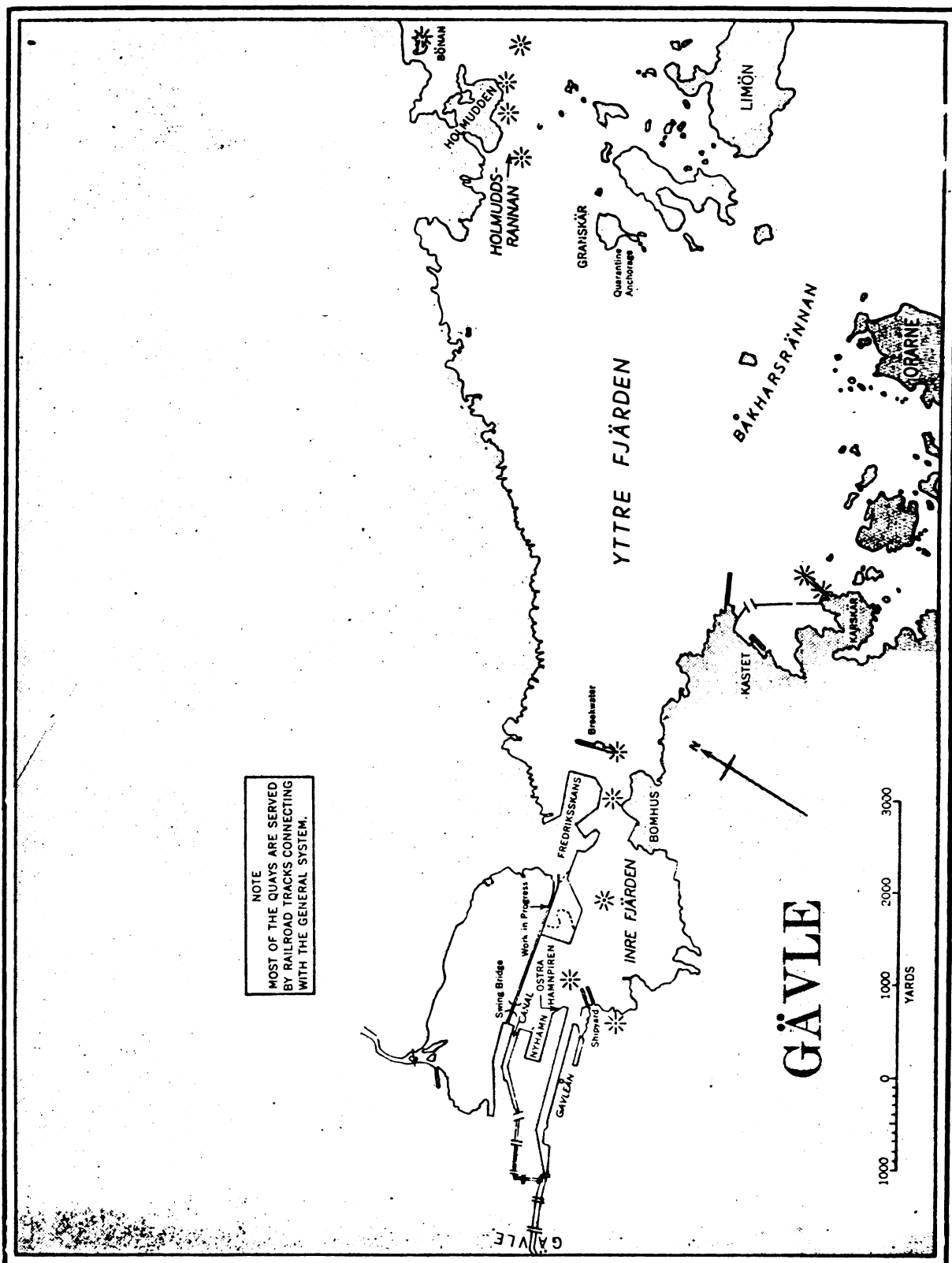
Berths.—At Fredriksskans there are about 4,380 feet of quayage of which 3,200 feet has a depth of 25 feet alongside, 700 feet has 22 to 26-foot depths, 330 feet has a 22-foot depth, and 150 feet has a depth alongside of 14 1/2 feet. In Nyhamn there are 2,990 feet of quayage, with a depth of 16 feet in the basin and alongside the quays. Östra Hamnpiren, on the southern side of the entrance to Nyhamn, has 611 feet of quayage, with a depth of 16 1/2 feet alongside. The quays on the northern side of Gavleån have a total length of 5,790 feet and those of the southern side have a total length of 5,300 feet; there is a depth alongside of 13 feet on both sides of the river. Most of the quays are served by railroad tracks connecting with the general railroad system.

At Karskärr there is a pier about 570 feet long, with depths of 9 to 26 feet along its eastern side and 22 feet along its western side. There is also a quay 492 feet long, with depths of 16 to 23 1/2 feet alongside.

At Kastet there is a pier 560 feet long with depths of 22 to 29 feet alongside. Westward of this pier is a quay 121 feet long.

Oil Harbor quay, 1,050 feet long, of which 630 feet has a depth of 25 1/4 feet alongside and the remainder 18 feet. A new oil pier, with a berthing length of 685 feet, has a depth of 36 feet alongside.

Several cranes of 2 to 12 ton capacities are located on the quays. Lifts up to 24 tons can be handled at the Fredriksskans quays by using two 12-ton cranes. A 5-ton floating crane is available. There are four conveyors at Fredriksskans. In addition to the above cranes there are 10 bridge-type cranes with capacities ranging from 8 1/2 to 10 tons. Tugs and lighters are available.



Supplies.—All kinds of ship's stores can be obtained. Water is piped to the quay on the northern side of Gävleån, and can also be supplied by water boat. During severe ice conditions, water can be obtained from an ice breaker. Vessels can coal alongside the quay at Gävle or from lighters in Yttre Fjärden. Fuel oil is supplied at Fredriksskans and Nyhamn.

Repairs.—A shipyard, at which are machine shops, a 40-ton sheers, and a marine railway with a capacity of 3,500 tons, is situated close southward of the entrance to Gävleån. A 5,000-ton floating drydock was available in 1962. Approximate dimensions are: 311 feet long over blocks, 82 feet wide (inside). Pontoon extensions can increase lifting capacity to 7,500 tons.

Communications.—Gävle is connected to the general railroad system. Regular steamer service is maintained with the principal Swedish ports, and with ports in other parts of Europe and in Great Britain.

Deratization.—See section 1-7.

Medical.—A hospital is available at Gävle.

COASTAL FEATURES—LANDMARKS (Continued)

7A-22 Between Trödjehällan and Gås-hällan, about 12 miles northward, the coast is fronted by numerous islands and dangers. The mainland and the larger islands are covered with forest. The anchorages and harbors on this part of the coast should not be used without local knowledge. Pilots can be obtained from Gävle, Bonan or Norrsundet (sec. 7A-19). Trödjefjärden is entered about 2 1/2 miles northwestward of Trödjehällan (60° 48'N., 17° 22'E.). A 5.6 m (3 fm.) unmarked shoal lies in the middle of the entrance. A survey in 1958 revealed several shoals in the channel and a controlling depth of 4.9 m (16 ft.). Iggon, an island lying about 3 1/2 miles northward of Edskon, is covered with dark woods and is conspicuous from seaward. The northern point of Iggon is known as Iggoskaten. Lights are shown during the fishing season on Skommarhallan, an islet lying about 1 1/2 miles northwestward of Trödjehällan, and on the eastern side of Iggon.

Approaches to Saltarsfjärden and Norrsundet.—Ostra Vicksellsgrund, with a depth of 5 m (2 3/4 fm.), and Vastra Vicksellsgrund, with a depth of 2 m (6 ft.), lie, respectively, about 2 1/2 miles north-northeastward and 3 miles northward of Iggoskaten. Spar buoys are moored on the eastern side of an 8.2 m (4 1/2 fm.) patch about 1/2 mile eastward of Ostra Vicksellsgrund and on the

eastern side of Vastra Vicksellsgrund. Utgrundet, a 3 m (1 3/4 fm.) patch marked by a spar buoy, and an unmarked 8.2 m (4 1/2 fm.) patch lie, respectively, about 1 3/4 miles and 2 1/4 miles northward of Iggoskaten. A number of dangers extend north-westward from the northeastern end of Iggon to the southern entrance point of Saltarsfjärden. Bjorn Beacon, a structure in the form of a truncated pyramid, stands on an islet about 5 miles northwestward of Iggoskaten. Forstugrund, a 4 m (2 1/4 fm.) patch marked on its northeastern side by a spar buoy, lies about 1 3/4 miles east-southeastward of Bjorn Beacon and a shoal awash lies about 1 1/2 miles southeastward of the beacon. Valkommen, a 6.8 m (3 3/4 fms.) patch marked on its northern side by a spar buoy, lies about 1 1/4 miles east-northeastward of Bjorn Beacon and a 3.6 m (2 fm.) patch marked on its northern side by a spar buoy lies about 800 yards northward of the same beacon; several other shoal patches lie between these dangers and the beacon.

Saltarsfjärden (Saltar Fjärd) is entered about 4 1/2 miles northwestward of Iggoskaten. The northern side of the entrance is encumbered by shoals, the southernmost of which is marked on its southern side by a spar buoy. Two range beacons, surmounted by triangular top marks, stand on the southern shore of the fiord. Ice usually obstructs Saltarsfjärden from the end of January to the beginning of April.

Norrsundet is a small harbor and loading place situated close northwestward of Saltarsfjärden. A conspicuous chimney stands on the northwestern side of the harbor. A channel about 105 feet wide, marked by spar buoys, and dredged to a depth of 7.3 m (24 ft.), leads into the harbor. The depths in the harbor are 3.9 to 7.9 m (13 to 26 ft.). Anchorage is prohibited in the vicinity of a submarine cable, the position of which is indicated by notice boards. There are about 919 feet of quayage at Norrsundet, with depths of 1.5 to 7 m (5 to 23 ft.) alongside. Railroad tracks connect some of the quays to the general railroad system. One of the quays is equipped with two 4-ton cranes. Large vessels anchor with their stern secured to rings located in the southeastern side of the harbor and load

from lighters. Vessels unable to complete loading in the harbor may do so at the road near Domansskar, a small island near the entrance to the port. Tugs are available. A customs station is located at Norrsundet. Provisions and water can be obtained, and minor repairs made. Ice usually obstructs the harbor from the end of January to the beginning of April.

Hallstensören Light is shown on an islet on the northwestern side of the entrance to the harbor of Norrsund. A light is also shown on the southeastern side of the channel, and another light is shown on the southern side of the harbor. Two range lights on the northwestern side of the harbor lead through a part of the entrance channel.

Directions.—Vessels from southward bound for Saltarsfjärden or Norrsundet should, when eastward of Iggöskaten, steer to pass between Utgrundet and a shoal lying about 1 mile northward of the northeastern part of Iggön, thence northwestward to pass close northeastward of Förstugrund. Vessels bound for Saltarsfjärden should, when the range beacons on the southern side of that fiord are in range bearing 234°, steer toward them, passing close southeastward of the spar buoy marking the southern side of the shoals in the entrance to Saltarsfjärden, and proceed to the anchorage.

Vessels bound for Norrsundet, after passing close northeastward of Förstugrund, should continue northwestward, passing northeastward of Valkommen. When Hallstensören Light bears 248°, they should steer toward it and proceed through the entrance channel, guided by the buoys and range lights.

ANCHORAGES

7A-23 Skutskär - Harnäs.—See section 7A-7.

Gävle (Yttre Fjärden).—See section 7A-18.

Gråbergsredan.—See section 7A-18.

Trödjeffjärden.—In $3\frac{3}{4}$ to $7\frac{1}{2}$ fathoms, sand and clay.

Saltarsfjärden.—In 10 fathoms, sand, exposed to easterly winds.

Part B. GÅSHÄLLAN TO HORNSLANDET

7B-1 Gåshällan (Gåshäll) ($61^{\circ}01' N$, $17^{\circ}17' E$.) is a small barren islet lying 4 miles north-northeastward of Björn Beacon. Shoals having a least depth of 3 m ($1\frac{3}{4}$ fms.) lie up to $\frac{3}{4}$ mile southeastward of Gashallan. A buoy is moored on the eastern side of this group of dangers. A 9.3 m (5 fm.) patch lies about $\frac{3}{4}$ mile east-southeastward of Gashallan. Gasholmen is an islet lying between Gashallan and the eastern extremity of Halvon Sundsmar, a peninsular nearly $1\frac{1}{4}$ miles westward. Synskar, another islet, lies close southeastward of Gasholmen.

Gåshällan Light is shown on Gåshällan. A light is also shown on the northern point of Synskär. A fishing light is occasionally shown on the northwestern extremity of Kusö about 2 miles northward of Synskär.

COAST—GENERAL

7B-2 Between Gåshällan and the southeastern point of Hornslandet, a peninsula lying about $37\frac{1}{2}$ miles northward, the coast is indented by numerous inlets which are encumbered by islets, rocks, and shoals. Many islands and dangers front the coast, the outermost banks lying about $11\frac{1}{2}$ miles from the mainland. The principal ports on this part of the coast are Söderhamn and Hudiksvall, both situated at the heads of inlets. There are also a number of harbors and loading places.

DEPTHS—OFF-LYING ISLANDS AND DANGERS—OUTLYING BANKS

7B-3 Depths throughout this area are very irregular.

Kusön is a wooded island lying nearly $\frac{1}{2}$ mile northward of Sundsmar. Between Kusön and Storjungfrun, the next principal island northward, rocks and shoals surround a group of islets and form a coastal barrier having a length of about $3\frac{3}{4}$ miles in a north and south direction. Two spar buoys mark the southern edge of this barrier where a passage lies between Kusön and Kusökalv, the southernmost islet. Two spar buoys mark the northeastern edge of the barrier where a passage lies between Storjungfrun and Tupparne, the northernmost islet. A fishing light stands on the northeastern extremity of Kusön.

Storjungfrun is a thickly wooded island lying about $8\frac{1}{4}$ miles northward of Gåshälan. The western shore is clear of off-lying dangers, but the northeastern and southern ends and the eastern shore should be given a berth of 1 mile. Shoals off the southern end of the island are marked by two spar buoys. A number of patches with a least depth of 9.1 m (5 fm.) lie in the entrance of the passage between Tupparne and Storjungfrun. The outermost of the dangers lying off the northeastern shore of Tupparne is marked by a spar buoy. A submarine cable extends from Storjungfrun to the mainland westward of it.

A stranded wreck lies close off the northeastern shore of Storjungfrun.

Storjungfrun Light is shown on the northeastern point of the island. A light is shown during the fishing season on an islet lying about $2\frac{3}{4}$ miles south-southwestward of the southern point of Storjungfrun.

Storgrundet, with a least depth of 0.5 m ($1\frac{1}{2}$ ft.) lies from 2 to $4\frac{3}{4}$ miles eastward of Storjungfrun. It is marked by four spar buoys in accordance with the uniform sys-

tem. Several patches with depths of 8.6 to 10 m ($4\frac{3}{4}$ to $5\frac{1}{2}$ fms.) lie off the southeastern end of Storgrundet. An 11 m (6 fm.) patch lies about $5\frac{3}{4}$ miles southeastward of the southern end of Storjungfrun.

Hällgrund is a group of shoals lying $6\frac{1}{4}$ to $7\frac{1}{4}$ miles north-northeastward of the northern end of Storjungfrun. Three spar buoys, one on the eastern side and two on the western side, mark the group in accordance with the uniform system.

Hällgrund Light is shown on the southern extremity of Hällgrund. A fog signal is sounded and a radiobeacon is transmitted from the light.

A dangerous wreck exists about 400 yards north-northeastward of Hällgrund Light.

Prästgrundet, about $10\frac{1}{4}$ miles northward of Storjungfrun, is a wooded and level island with some large rocks off its southern end. A submarine cable is laid from Prästgrundet to the mainland west-southwestward of the island. A group of shoals with a least depth of 1.8 m (6 ft.) extends about $\frac{3}{4}$ mile off the northeastern side of the island; a spar buoy is moored on the northeastern side of this group. A bank with a least depth of 11.9 m ($6\frac{1}{2}$ fms.) lies about 4 miles northward of Prästgrundet.

Prästgrundet Light is shown near the middle of the island. A fishing light is shown occasionally on the southwestern side of Prästgrundet.

Agön, about 4 miles southward of the southern end of Hornslandet, is the largest and easternmost of several islands which extend eastward from Våtnäsudde (sec. 7B-12). Agön is of moderate height and wooded, as are the islands of Drakön, Kräkön, and Innerstön lying westward of it. A submarine cable connects Agön, Drakön, Kräkön, and Innerstön with the mainland. The southern side

of Agön is indented by a narrow inlet which provides shelter for small vessels; this side of the island is fronted by islets and dangers to a distance of about $1\frac{1}{2}$ miles offshore.

Agön Light ($61^{\circ}33' N.$, $17^{\circ}28' E.$) is shown on the eastern extremity of Agön. A fog signal is sounded from the light. **Agön Northwest Light** is located a little over $\frac{1}{2}$ mile northwestward of Agön Light. These two lights form a range which, when in line 143° astern, leads through the eastern approach channel to Hudiksvall.

A beacon is located close southeastward of Agön Northwest Light.

Kräkskär Light is shown on the northern point of Kräkön and a light is also shown on the southwestern point of that island.

Gretas Klackar is a group of banks, with depths of 10.3 to 18.3 m ($5\frac{3}{4}$ to 10 fms.), lying 8 to 10 miles east-southeastward of Agön. A spar buoy marks the western edge of the westernmost bank.

Dangers nearer the coast, and those in the approaches to ports and loading places, are described with the related features.

NAVIGATION

7B-4 See section 7A-4.

COASTAL FEATURES—LANDMARKS

7B-5 Sundsmars Redd, between Halvon Sundsmar and Kuson, is a well-protected anchorage with a depth of 10.9 m (6 fms.), clay and rock. It is approached by two channels, one passing southward of Kuson and the other passing westward of that island. The channel from eastward has a depth of 5.5 m (18 ft.), but is narrowed by a reef and shoals extending from the southern side of Kuson; the channel from northward has a depth of 4.5 m (15 ft.) and lies close to the western side of Kuson. Dangers on the sides of both channels are marked by spar buoys. Sundsmar Light is shown on the shore on the southern side of the channel southward of Kuson. Ice

usually obstructs Sundsmars Redd from the middle of December to the latter half of April. Pilots are obtained from Bonan Pilot Station.

Directions.—Vessels approaching Sundsmars Redd should steer for Gåshällan Light between the bearings of 225° and 265° . When the passage between Kusön and Gåsholmen is open, they should steer to pass 200 to 400 yards northward of Gåsholmen, thence proceed through the buoyed channel to the anchorage about $\frac{1}{2}$ mile westward Sundsmar Light.

Vessels approaching the anchorage from northward with a draft of 14 feet can use the channel between Sunnan Light and the dangers lying eastward of the light. Thence, passing eastward of Sandbanken, an extensive shoal lying close northwestward of Kusökalv, they should keep close to the western side of Kusö and within the buoyed channel.

Sunnan Light is shown on an islet lying about $2\frac{3}{4}$ miles northward of the northwestern point of Kusön. Two fishing lights, forming a range, are occasionally shown at Trollharen (Granöskaten), on the mainland, about $\frac{3}{4}$ mile west-southwestward of Sunnan Light.

7B-6 **Ljusnefjärden.**—Ljusnefjärden, in which are the harbors of Vallvik, Ljusne, and Ala, is entered about 4 miles west-northwestward of the northern end of Storjungfrun. Skeppskolsberget, about $13\frac{1}{2}$ miles west-southwestward of Söderhamn (sec. 7B-10), is a 1,056-foot hill which is a good distant landmark in clear weather. A conspicuous factory chimney stands at Vallvik, about $4\frac{1}{2}$ miles west-northwestward of Storjungfrun Light.

Blomman, a 6.4 m ($3\frac{1}{2}$ fms.) shoal marked by a buoy, lies in the eastern approach to Ljusnef

järden, about $2\frac{3}{4}$ miles northwestward of Storgrytan Light. A light is shown at Fäbovallshararna a group of wooded islets lying near the shore, close within the southern entrance point of Ljusnefjärden. Säggrund, a 4-foot shoal, lies about $\frac{1}{2}$ mile northeastward of Fäbovallshararna. A spar buoy marks the southwestern side of Säggrund. A spar buoy marks the southern limit of a 26-foot shoal close southeastward of Säggrund. Abrahamsharen is an islet lying about 1 mile north-northeastward of Fäbovallshararna. Nestorsgrund, marked on its southern and northern sides by spar buoys, has a depth of $1\frac{3}{4}$ fathoms and lies about $\frac{1}{2}$ mile west-southwestward of Abrahamsharen. Storgrytan is an islet lying about $\frac{1}{2}$ mile northwestward of Fäbovallshararna. A group of rocks, marked by a spar buoy on their southern side, lie awash about 650 yards north-northeastward of the northwestern end of Storgrytan. A light is shown on the northwestern end of Storgrytan and another light is shown on Lillgrytan, an islet near the southwestern shore of Ljusnefjärden.

Ice usually obstructs navigation in Ljusnefjärden during February and March.

Pilots can be obtained from Lilljungfrun (sec. 7B-9) Pilot Station.

Vallvik ($61^{\circ}12' N.$, $17^{\circ}11' E.$) is a loading place on the southern side of Ljusnefjärden, southward of Fäbovallshararna. It has a well-sheltered harbor with a depth at the anchorage of 32 feet, mud and clay. There is a pier 656 feet long with depths alongside of 17 to $30\frac{1}{2}$ feet on the northeastern side and 13 to $30\frac{1}{2}$ feet on the southwestern side. Two range lights are shown, respectively, on the head of the pier and near its root. There is also a quay 633 feet long, off which, at a distance of about 5 feet, are depths of 7 to $16\frac{3}{4}$ feet. A $1\frac{1}{2}$ -ton crane is available on the quay. Funnel-shaped hoppers are used for unloading ore from ships into cable cars located on the piers. Tugs are available. Provisions can be obtained. Limited amounts of water, diesel oil, and fuel oil can be supplied.

Ljusne (Liusne) is a loading place at the mouth of Ljusneälv, a river which flows into the head of Ljusnefjärden. It has two good and sheltered anchorages with clay bottom, one in 33 feet westward of Storgrytan and the other in 18 feet north-northwestward of Lillgrytan. Because of limited space, vessels at anchor secure their sterns to piles or moorings on the islands. A channel varying from 82 to 98 feet in width and dredged to $14\frac{3}{4}$ feet leads to berths at the river mouth. A quay on the northern side of the river has a berthing length of 262 feet with $11\frac{1}{2}$ feet alongside. On this quay are railroad tracks connecting with the general railroad system, and a 2-ton crane. Tugs are available. There is a customs station and a hospital in Ljusne. Provisions, ship's stores, and small quantities of coal and fuel oil can be obtained. A machine shop is located in the town.

7B-7 Ala (Nyhamn), a loading place about $1\frac{1}{4}$ miles northeastward of Ljusne, has a well-sheltered anchorage with a depth of 23 feet, mud, southeastward of Hovskär, an islet lying east-northeastward of the town. Vessels at anchor secure their sterns to moorings on Hovskär. The entrance channel has a depth of 22 feet, and is marked by spar buoys. Two range lights are shown on Hovskär. A small inner harbor has a depth of $15\frac{3}{4}$ feet. Cargo is loaded and discharged by means of lighters. Tugs are available. Provisions can be obtained.

Directions.—Approaching Ljusnefjärden from southward, pass between Storgrytan and Tupparne, keeping in midchannel with Skeppskölsberget bearing 287° . When Kalkudden, the western point of Storgrytan, bears 005° steer about 329° to pass about $\frac{3}{4}$ mile northeastward of Ljusnenäset (Liusnenäset), a point south-southeastward of Vallvik. When about 2 miles from Storgrytan steer for Vårdberget, a high rounded hill on which stands a summer house and flagstaff, situated close northeastward of Ljusne, on a course of about 302° . After passing between Fäbovallshararna and Säggrund, pro-

ceed to the buoyed channels leading to Vallvik, Ljusne, or Ala. If bound for Vallvik use either of two channels which lead, respectively, northward and southward of Storgrytan. The northern channel passes southward of a 24-foot shoal, marked by a spar buoy on its southern side, lying about 300 yards north-northwestward of the north-northwestward of the northwestern end of Storgrytan. Range lights at Vallvik lead through the approach channel on a bearing of 145° . If bound for Ljusne, and after clearing Storgrytan, steer with range boards in line bearing 260° and then with inner harbor range boards in line bearing 293° . If bound for Ala, and after clearing Säggrund, steer with the range lights on Hovskär in range 338° ; this leads to the entrance to the outer anchorage.

Approaching Ljusnefjärden northward of Storgrytan, steer for the conspicuous chimney at Vallvik, bearing between 258° and 272° , passing southward of Blomman. When Vårdberget is open northeastward of Storgrytan and bears about 302° , steer for it on that bearing and proceed as previously directed.

APPROACH TO SÖDERHAMN (SÖDERHAMNS INLOPP)

7B-8 Norrutharet, an islet lying about 5 miles northward of Storgrytan, is situated in the entrance of an inlet which extends about 7 miles northwestward to Söderhamn.

Norrutharet Light is shown on the northern end of Norrutharet. Another light is shown on the northern side of Enskär, an islet lying about 1 mile south-southwestward of Norrutharet Light. Two range lights are shown, when required by pilot vessels, on Rönnskär, an islet lying about $\frac{1}{2}$ mile southward of Norrutharet. Lilljungfrun Beacon,

consisting of two wooden triangles, points together, stands on Lilljungfrun, an islet lying close westward of Norrutharet.

Yttergrund northwestward of Hällgrund and about $2\frac{1}{2}$ miles northeastward of Norrutharet Light, has a least depth of $1\frac{3}{4}$ fathoms and is marked on its eastern side by a spar buoy. Numerous shoal patches surround Yttergrund, and rocks and shoals lie between it and the island of Svartö, which is about $1\frac{1}{2}$ miles north-northwestward of Norrutharet and close to the mainland. Skroveln, a $1\frac{3}{4}$ -patch marked on its southern side by a spar buoy, lies about $1\frac{1}{4}$ miles eastward of Svartö. Storgrund a $2\frac{3}{4}$ -fathom patch marked by a spar buoy on its northern side, lies about $\frac{1}{2}$ mile eastward of Norrutharet Light. Norra Finskan (Lilla Finngrund), a 1-foot patch marked on its northeastern side by a spar buoy, lies about 1 mile east-southeastward of Norrutharet Light. A $4\frac{3}{4}$ -fathom patch, marked on its southern side by a spar buoy, lies about 1 mile southeastward of Rönnskär. The last-mentioned three buoys are equipped with radar reflectors.

Navigation.—Vessels approaching from southward and having arrived at a position about 1 mile westward of Västra Banken Light Vessel (sec. 7A-3) may steer a course of 330° for about 25 miles to a position about 4 miles eastward of Norrutharet Light.

Vessels approaching from northward may leave the coastal track at a position about $1\frac{1}{4}$ miles eastward of Agö Light (sec. 7B-3) and steer a course of 188° for about $17\frac{1}{2}$ miles to a position about 4 miles eastward of Norrutharet Light.

These tracks clear all coastal and off-lying dangers, and lead over charted depths of more than 10 fathoms.

Currents.—Currents are negligible in the approach to Söderhamn.



APPROACH TO SÖDERHAMN

From Swedish Sailing Directions

The water level may vary from 2 feet above to $1\frac{1}{2}$ feet below mean level. Southerly and westerly winds cause a higher level, and northerly winds a lower level.

Ice is usually an obstruction in the approach to Söderhamn from the beginning of January to the beginning of April; but, when possible, the harbor is kept open by ice-breakers.

Channels.—The approach to Söderhamn is encumbered by numerous islets, rocks, and shoals for almost 4 miles within the entrance of the inlet. The dangers bordering the channels to Söderhamn and to the anchorages and loading places in the approach are marked in accordance with the uniform system of buoyage. Radar reflectors are positioned the following approximate distances and directions from Norrutharet Light: about $\frac{2}{3}$ mile and $1\frac{1}{2}$ miles west-southwestward; slightly less than 1 mile southward; and about $\frac{2}{5}$ mile southeastward.

The channel to Söderhamn is entered between Norrutharet and Lilljungfrugrund, a 21-foot patch lying about $\frac{1}{2}$ mile northward and marked by a spar buoy. Otterhällan Light ($61^{\circ}16'N.$, $17^{\circ}15'E.$) is shown from a rock about $1\frac{1}{2}$ miles west-northwestward of Norrutharet Light. Two shoal patches marked by spar buoys lie on the northern side of the fairway between Lilljungfrugrund and Otterhällan Light. The buoyed channel leading southward of Otterhällan Light is marked by a lighted range, the forward light is shown close southeastward of Brandskar and the rear light is shown about 1,000 yards farther westward. From Brandskar Light to Söderhamn the channel is marked by spar buoys, two pairs of range lights, and other lights.

Two shoals with depths of 2 and $2\frac{3}{4}$ fathoms lie about $\frac{1}{2}$ mile eastward of Skuggskär. The 2-fathom shoal lie on the northern side

of the channel and the $2\frac{3}{4}$ -fathom shoal lies on the southern side of the channel. Both dangers are marked by spar buoys.

7B-9 Anchorages.—Lilljungfruns Redd is an anchorage southwestward of Lilljungfrun, with a depth of 7 to $7\frac{1}{2}$ fathoms, mud and stone. Vessels of deep draft can use this anchorage to complete loading or to unload to the limiting draft. Tugs can be obtained; a telephone is available at Lilljungfrun Pilot Station. The channel leading to the anchorage has a depth of over $5\frac{1}{2}$ fathoms. A spar buoy marks the edge of a reef extending southwestward from Lilljungfrun. Törnberggrund, marked by a spar buoy, and Kullharsgrund, marked by a spar buoy, are $2\frac{3}{4}$ -fathom patches lying about 1 mile westward and $\frac{3}{4}$ mile west-southwestward, respectively, of Norrutharet Light.

Branthälls Redd is an anchorage close westward of Branthäll, a high islet lying about 2 miles westward of Lilljungfrun Beacon. Vessels can anchor in depths of 5 to 8 fathoms, mud, and secure their sterns to rings on shore. Tugs are available and water can be obtained from a water boat.

Prästhölm's Redd, west-northwestward of Brandskär, has a depth of 4 fathoms, mud.

Cable—Prohibited Anchorage.—A submarine power cable is laid between Hallgrund lighthouse and the southern coast of Svato, about $4\frac{1}{4}$ miles westward. Anchoring and fishing are prohibited within 164 feet on each side of the cable.

Källskär, a loading place on the southern side of the approach to Söderhamn and about $3\frac{1}{4}$ miles westward of Norrutharet Light, has outer and inner harbors with depths of 25 and 16 feet, respectively, mud and rock. There are quays with depths alongside of 7 to 10 feet. Tugs are available and water can be obtained from a water boat.

Sandarne, a loading place about $\frac{1}{2}$ mile northwestward of Källskär, has an anchorage with a depth of 24 feet, mud. Light beacons in range $238\frac{1}{2}^{\circ}$ mark the fairway of a buoyed channel entered southward of Skugskär which leads to the anchorage. This channel will accommodate vessels with a draft of $22\frac{1}{2}$ feet. A factory chimney at Sandarne is conspicuous. Massakajen has a berthing length of 541 feet with $19\frac{1}{2}$ feet alongside and 21 feet about 13 feet off the face of the dock. Limestone Wharf has a berthing length of 607 feet with $5\frac{1}{4}$ to $11\frac{1}{2}$ feet alongside. South of Mussakajen, a discharge wharf is under construction (1961) with an expected depth alongside of $24\frac{1}{2}$ feet. Railroad tracks connect some of the quays with the general railroad system. Vessels lie between the quays and dolphins placed offshore. Water is supplied by water boat from Stugsund. Coal can be obtained.

At Lervik, close northward of Sandarne, vessels with a draft of 18 feet can enter Söderhamn oil harbor and discharge at the oil wharf in a depth of $19\frac{1}{2}$ feet. In 1961, the harbor was being deepened to a least depth of $27\frac{3}{4}$ feet.

Langrör, a loading place about $\frac{3}{4}$ mile northward of Sandarne, has a depth of 19 feet, mud, at its anchorage. There are quays with a depth of 12 feet alongside. Water can be supplied at the quays or by water boat. There is a marine railway for small vessels.

Lilljungfrun life saving station is at Rönnskär.

Pilots.—Lilljungfrun Pilot Station is at Rönnskär. Pilots meet vessels about $\frac{3}{4}$ mile southward of Hallgrund (sec. 7B-3). There is a pilot lookout station at Stugsund. For general information regarding pilotage in Swedish waters, see section 1-25.

Directions.—From a position about 4 miles eastward of Norrutharet Light steer to bring Brändskär front and rear lights in range 271° . This range leads southward of Lilljungfrugrund and Otterhällan Light, and northward of Fyrstensklacken, a 1-fathom patch lying about $\frac{1}{4}$ mile southeastward of Otterhällan Light and marked on its northeastern side by a spar buoy.

If proceeding to Lilljungfruns Redd, round Lilljungfrun, keeping a safe distance off the rocks westward of that islet and passing eastward of Törnbergsgrund. Passing westward of Kullharsgrund steer for the light on the northern side of Enskär, on a heading of 160° . When clear of Kullharsgrund, come right and anchor when the custom house and pilot lookout station on Rönnskär are in range bearing 098° .

Vessels bound to any of the loading places and other anchorages in the inlet, or to Söderhamn, can proceed through the various channels, being guided by the buoys and other navigational aids, but a pilot should be taken by vessels not having local knowledge.

SÖDERHAMN

Position: $61^{\circ}18' \text{ N.}, 17^{\circ}05' \text{ E.}$

Depths: Approach channel, 20 feet (maximum draft).

Anchorage (Stugsund), $20\frac{1}{2}$ feet.

Channel to Söderhamn, $11\frac{3}{4}$ feet (maximum draft).

Berths, $6\frac{1}{2}$ to 20 feet.

Tidal rise: Negligible.

7B-10 Söderhamn is situated at the head of the inlet forming its approach. The port consists of an outer harbor at Stugsund and an inner harbor at Söderhamn.

Navigation.—See section 7B-8.

Currents.—See section 7B-8.

Depths.—For depths in outer approach channels see section 7B-8. The channel from Branthälls Redd to Stugsund can accommodate vessels drawing 20 feet and that from Stugsund to Söderhamn can accommodate vessels drawing $11\frac{3}{4}$ feet.

Harbor.—Stugsund, the outer harbor and principal loading place of the port of Söderhamn, has quays and an anchorage with a depth of 20 feet, mud. Vessels unable to complete loading at Stugsund can do so at Branthälls Redd or Lilljungfruns Redd. Mariehill is a loading place on the northeastern shore opposite Stugsund. Grundvik, another load-

ing place, lies close southeastward of Stugsund. The inner harbor is at Söderhamn and is bordered by quays. Depth gauges are located at the boat harbor in Stugsund, at Mariehill, and at the harbor office at Söderhamn. The line-throwing apparatus of the Söderhamn lifesaving station is maintained at Stugsund.

Stugsund was reported in 1959 to be a good radar target at a distance of 10 miles.

Pilots.—See section 7B-9.

Directions.—See section 7B-9.

7B-11 Söderhamn, a town with a population of about 12,000, exports principally lumber and wood pulp. There is a customhouse in the town. The town of Stugsund lies about 1 mile eastward of Söderhamn.

Quays at Stugsund have a total length of about 2,890 feet with depths of 18 to 20 feet alongside. At Söderhamn there is about 2,625 feet of quayage with depths alongside of $6\frac{1}{2}$ to $13\frac{1}{2}$ feet. The quays lie on both sides of the mouth of a small river flowing through the town. At both Stugsund and Söderhamn the quays are connected to the general railroad system. There are two 5-ton electric and two 10-ton hand cranes at Stugsund. A 40-ton hand crane and two electric cranes of $1\frac{1}{2}$ and 3-ton capacities are available at Söderhamn. Tugs and lighters are available.

Provisions and fresh water can be obtained, the latter from either hydrants on the quays or a water boat. A stock of coal is maintained. Minor repairs can be made. A marine railway for small vessels is located at Långvär. There is regular steamer service to other Swedish ports. A hospital is available.

COASTAL FEATURES—LANDMARKS

(Continued)

7B-12 Klacksörarna (Klackörarne), a group of islets lying about 2 miles west-northwestward of Prästgrundet (sec. 7B-3), extends in a northwesterly direction parallel to the coast. Several shoal patches lie within $\frac{3}{4}$ mile of the eastern side of the group. A fishing light is shown on Vitgrund (Hvitgrundet), an islet lying about 1 mile north-northwestward of the northwesternmost islet of Klacksörarna. Skärså Fishing Light is shown from a position about 2 miles westward of Vitgrund Light. A $3\frac{1}{2}$ -fathom patch lies about $1\frac{1}{4}$ miles east-southeastward of Vitgrund and a $3\frac{1}{4}$ -fathom patch, marked by a spar buoy, lies slightly more than $\frac{1}{2}$ mile east-northeastward of the same islet.

Långplågen is a loading place situated at the head of a bight, about $7\frac{3}{4}$ miles north-westward of Prästgrundet. An anchorage off Långplågen has a depth of about 5 fathoms, mud. A channel, which will accommodate vessels with a draft of 18 feet, leads to the anchorage, passing between Vitgrund and Korvgrund, an islet lying about $\frac{3}{4}$ mile north-northwestward. Dangers adjacent to the channel are marked by spar buoys. Ice usually obstructs navigation from the middle of December to the beginning of April. Pilots can be obtained from the pilot stations at Rönnskär or Hölick (sec. 7B-14).

Korsholmsudde is a point lying about 4 miles eastward of Långplågen. Storgund, on which are some rocks above water, lies about $1\frac{1}{4}$ miles eastward of this point. A number of other dangers lie within $2\frac{1}{4}$ miles eastward and northeastward of Korsholmsudde.

Långvind ($61^{\circ}28' N.$, $17^{\circ}08' E.$), a loading place, lies at the head of a bay, about $3\frac{1}{2}$ miles northwestward of Korsholmsudde. There is anchorage in the harbor with a depth of 16 feet, mud and sand. A channel, which will accommodate vessels with a draft of 12 feet, leads to the anchorage. A 2-fathom patch near the northern side of the seaward entrance to the channel is marked by a spar buoy. Lotshällan Beacon, constructed of whitewashed stone, stands on the southern side of the channel. Other dangers lying inshore from the entrance and near the fairway are unmarked. There is a small wharf, with a depth of 7 feet alongside, at Langvind.

Enångersviken is an inlet entered about $4\frac{1}{2}$ miles westward of Agön (sec. 7B-3). Brantbådarna, a $1\frac{3}{4}$ -fathom patch, and Idensgrund, a 2-fathom patch marked on its eastern side by a black and white spar buoy with a ball, lie nearly 1 mile southeastward and $1\frac{1}{2}$ miles east-northeastward of Fiske, an islet lying about $1\frac{1}{4}$ miles eastward of the southern entrance point of Enångers-

viken. Several islands lie in the southern part and at the entrance of Enångersviken. An 8-foot patch, marked by a spar buoy, lies about $\frac{1}{3}$ mile eastward of the northernmost of these islands. Fishing lights are occasionally shown on Fiske; at Haganäs, a fishing harbor on the coast, about $1\frac{3}{4}$ miles southwestward of Fiske; and on Våtnäsudde (Wålnäs-udde), the northern entrance point of Enångersviken.

Enånger, a loading place at the head of Enångersviken, has a harbor with a depth of about 14 feet, clay. Vessels usually finish loading at an anchorage in Essviken, an inlet about $1\frac{1}{4}$ miles eastward of the harbor, where there is a depth of $5\frac{1}{2}$ fathoms, mud. The approach channel leads northward of the islands and dangers in the entrance of Enångersviken; it has a depth of over $5\frac{1}{2}$ fathoms to Essviken, but from there to the harbor at Enånger there is a least depth of 10 feet. A small pier is located at Enånger. Pilots can be obtained from Höllick.

APPROACHES TO HUDIKSVALL

7B-13 Between Våtnäsudde and Hornslandet, about 8 miles northeastward, the coast is indented by several fjords, at the entrances of which are numerous islands and dangers. Hudiksvall, Saltvik, Igessund, and Snäckmora are among the several harbors and loading places situated in these fjords.

Hornslandet, on the northern side of the eastern approach to Hudiksvall, is a partially wooded peninsula 358 feet high. From a distance northeastward it appears as an island. Its eastern side is steep-to. Höllickskär Light is shown from the southwestern extremity of Hornslandet. A fishing light is occasionally shown at Höllick, a fishing harbor lying nearly $\frac{1}{2}$ mile north-northwestward of Höllickskär Light.

Blaxåsberget rises to a height of 1,404 feet about 11 miles west-southwestward of Hudiksvall. This mountain is steep on its eastern and southern sides, and it is most conspicuous from southeastward. Rogsta Church, standing about $1\frac{1}{2}$ miles northeastward of Hudiksvall, is also conspicuous.

Navigation.—See section 7A-4.

Currents in the approaches to Hudiksvall are negligible.

The water level is lowered by northerly winds and raised by southerly winds.

Ice usually covers Hudiksvallsfjärden, between Saltvikssund and the harbor of Hudiksvall, from the middle of December to the end of April.

The southern approach to Hudiksvall is made through Kråksundet (Kråkö Sound), the passage between Kråkön and Innerstön (sec. 7B-3), which will accommodate vessels with a draft of 23 feet. A group of shoal patches, with a least depth of 4 fathoms, lies about $1\frac{1}{2}$ miles southward of the southern end of Kråkon. Bådestenarne, a rock above water, lies in the middle of the southern entrance of Kråksundet. A $3\frac{3}{4}$ -fathom patch lies on the western side of the fairway, about 1 mile south-southwestward of Bådestenarne. A spar buoy marks the edge of a shoal fringing the western side of Kråkön. Ravelsgrund, a low islet, lies on the western side of the northern entrance of Kråksundet. There is anchorage in Kråksundet in $3\frac{1}{4}$ to $4\frac{1}{4}$ fathoms, mud and gravel, close southward of Ravelsgrund.

Aftonvardsskärgrund (Aftonwards), with a depth of $1\frac{1}{2}$ fathoms, lies about 1 mile north-northeastward of the northern point of Innerstön; it is marked on its eastern side by a spar buoy. Jasonsgrund, a $1\frac{1}{4}$ -fathom patch, marked by spar buoys, lies about $2\frac{1}{2}$ miles north-northwestward of the northern point of Kråkön. Ljusgrundshanken, a shoal with a least depth of 5 feet, lies about 3 to $4\frac{3}{4}$ miles northward of Kråkön. It is marked by spar buoys on its eastern, southeastern and western sides. Norra Ljusgrund Beacon, a white conical structure surmounted by a spar and disk, stands on the eastern end of Norra Ljusgrund, an islet lying about $3\frac{3}{4}$ miles northward of Innerstön.

The eastern approach to Hudiksvall is between Agön and Hornslandet and will accommodate vessels with a draft of $30\frac{1}{2}$ feet. Olofsgrund is a group of shoal patches having a least depth of $2\frac{3}{4}$ fathoms and lying

about 1 1/3 miles northward of Agön Light (sec. 7B-3). The northeastern patch is marked on its eastern side by a **spar buoy**. Myran, a 1 1/2-fathom patch marked on its southeastern side by **spar buoy**, lies about 1 1/4 miles southeastward of Hölickskär Light. Several patches, with depths of 1 3/4 to 5 1/2 fathoms, lie near Myran. Myran Lighted Whistle Buoy with a **radar reflector** is moored about 800 yards southward of Myran. Hudiksgrund, having a least depth of 2 1/2 fathoms, lies about 1 1/2 miles south-southwestward of Hölickskär Light; It is marked on its southern side by a **spar buoy** equipped with a **radar reflector**. A 5 1/2-fathom patch lies about 1 1/2 miles north-eastward of the northwestern extremity of Agön. Gräsören is the southernmost of a group of islands lying off the western side of the southern part of Hornslandet. A **spar buoy** marks the southwestern side of the dangers fringing Gräsören.

Hudiksvallsfjärden is entered through Saltvikssund, a passage between Saltviksudde, a point lying about 2 1/2 miles north-northwestward of Norra Ljusgrund Beacon, and the western side of the peninsula of Gackerön, about 3/4 mile eastward of Saltviksudde. Sandgrund, a large shoal, lies nearly in the middle of the southern end of Saltvikssund, and a chain of shoals extends north-northwestward from it into Hudiksvallsfjärden. **Spar buoys**, a **light buoy**, and a **beacon** mark the dangers adjacent to the channels in Saltvikssund and Hudiksvallsfjärden.

A submarine cable crosses the entrance to Saltvikssund. The cable is laid in a north-west-southeast direction and crosses the southern end of Sandgrund.

Lights are shown on Saltviksudde and the southwestern point of Gackerön. Two range lights are shown on Granskär, an islet lying about 3/4 mile southeastward of the lighthouse on Gackerön. A set of range lights is located on islets south-southwestward of Granskär.

Caution.—A defensive area is located in Saltvikssund; surface navigation is permitted through the area but anchorage and

fishing are prohibited due to the possible presence of bottom mines. During thunderstorms passage through the area may be dangerous.

7B-14 Channels.—Two channels, one on either side of Ljusgrundsbanken, lead from seaward to the entrance of Saltvikssund. The channel on the western side will accommodate vessels with a draft of 18 feet, and the one on the eastern side, vessels with a draft of 30 1/2 feet. Vessels with a draft of 29 1/2 feet can proceed through Saltvikssund to the head of Hudiksvallsfjärden by keeping in the deep water channel eastward of Sandgrund. The channel in Saltvikssund is marked by **spar buoys** in accordance with the uniform system; in Hudiksvallsfjärden there are beacons in addition to buoys.

Anchorage.—**Olmsundet**, lying between the islands of Tuna Olmen and Idenors Olmen, about 1 3/4 miles westward of Hölickskär Light, is a harbor of refuge with depths of 5 to 11 fathoms, clay. The channel through Olmsundet is available to vessels with a draft of 19 1/2 feet. A shoal on the northern side of the western entrance is marked by a **spar buoy**.

Fläskvik, a small bay on the western side of Innerstön, is well-sheltered and has good holding ground in depths of 5 to 16 fathoms, mud. To enter from northward, vessels should steer for the northwestern point of Innerstön, bearing between 259° and 270°, round that point at a distance of about 200 yards, and proceed to anchorage in the bay.

About 1/4 mile southward of Norra Ljusgrund Beacon there is anchorage in 10 fathoms, mud and clay.

Snäckmora (61°37' N., 17°04' E.) a loading place about 12 miles west-northwestward of Agö Light, lies at the head of Kyrkbyfjärden. At the anchorage off Snäckmora there are depths of 5 to 7 1/2 fathoms, clay. There is a small pier. A channel, with a least depth of 23 feet, leads from the fairway

northward of Innerstön to the anchorage. The channel is buoyed.

Iggesund, a loading place about 2 miles north-northeastward of Snäckmora, lies at the western extremity of Iggesundfjärden. There are two harbors, the outer, in Gåsfjärden, with depths of 26 to 39 feet, and the inner with depths of 13 to 23 feet; mud bottom in both harbors. A channel, dredged to a depth of $24\frac{1}{2}$ feet, and marked by spar buoys, leads from seaward to the outer harbor. A light is shown from the shore on the southern side of the entrance to Gåsfjärden. The channel from the outer to the inner harbor will accommodate vessels with a draft of 12 feet; it is marked by spar buoys and several pairs of range lights. Ice is usually an obstruction from December to April.

At Iggesund, there is a wharf 394 feet long, with depths of $9\frac{1}{2}$ to $14\frac{1}{2}$ feet alongside, and three piers with depths of 11 to $17\frac{1}{2}$ feet alongside. There are five cranes with capacities of $1\frac{1}{2}$ to 6 tons. Tugs are available. Ship's stores, provisions, water, and fuel oil can be obtained. Minor repairs can be made; a marine railway for small vessels is located on Skälölandet, eastward of Iggesund. Iggesund is connected to the general railroad system.

Saltvik, a loading place lying close southward of Saltvikssudde, has depths of $9\frac{1}{2}$ to $18\frac{1}{2}$ feet, clay, in its harbor. There is about 1,900 feet of quayage, with a depth of $8\frac{1}{2}$ feet alongside. Tugs are available. Water can be obtained.

Pilots for Hudiksvall, and the loading places adjacent to the approaches to that port, are obtained from a pilot station located at Hölick. Pilots meet incoming vessels near Myran Lighted Whistle Buoy. Departing vessels obtain pilots from Hudiksvall. For general information regarding pilotage in Swedish waters, see section 1-25.

7B-15 Directions.—Vessels approaching from southward or southeastward, having arrived at a position about $1\frac{3}{4}$ miles eastward of Agö Light, should steer northwest-

ward until Kråkskär Light (sec. 7B-3) bears about 278° , when they should steer for the light on that bearing, passing between Agön and Olofsgrund. When the light on Saltvikssudde bears 323° , they should steer for it on that bearing, passing close southwestward of the spar buoy marking the shoal extending from Gräsören, and between Ljusgrundsbanken and Tuna Olmen, thence being guided by the buoys and beacons which mark the channels through Saltvikssund and in Hudiksvallfjärden. This track leads close eastward of a $5\frac{1}{2}$ -fathom patch lying about $1\frac{1}{2}$ miles northeastward of the northwestern point of Agön. The two lights on Agön, in range 143° , astern, also lead eastward of Ljusgrundsbanken toward Saltvikssund.

Vessels approaching from southward, and intending to pass through Kråksundet, should steer for the light on the southwestern point of Kråkön (sec. 7B-3), bearing 000° , this course leading to the southern entrance of the sound. Keeping in midchannel through Kråksundet, vessels should pass close eastward of Ravelgrund, thence steer about 348° , passing eastward of the spar buoy marking Aftonvardskärgrund and westward of the spar buoys marking Jasongrund. Nearing the spar buoy marking the western side of Ljusgrundsbanken, vessels should alter course to pass between that buoy and a spar buoy marking a $2\frac{3}{4}$ fathom patch westward of it, thence proceed to the entrance of Saltvikssund, being guided by the buoys marking the dangers on the sides of the channel.

The channel on the eastern side of Ljusgrundsbanken may be approached from Kråksund by steering northeastward after passing Ravelgrund and bringing Kråkskär Light to bear 188° , then steering with the light astern on that bearing until eastward of the spar buoy marking the southeastern end of Ljusgrundsbanken, and proceeding as previously directed.

Vessels approaching from eastward or northward, having arrived at a position about $2\frac{1}{2}$ miles east-southeastward of Hornsudde, the southeastern point of Hornlandet, should steer for Kråkskär Light, bearing

about 256°, passing between Olofsgrund and Myran. When Norra Ljusgrund Beacon bears about 313° and is open well southwestward of Gräsören, they should steer for the light on Saltviksudde, bearing 323°, and proceed as previously directed.

HUDIKSVALL

Position: 61°44' N., 17°07' E.
Depths: Approach channel, 32 feet.
 Anchorage, 4¼ to 14¾ fathoms.
 Harbor, 23 to 39 feet.
 Berths, 6½ to 33 feet.
Tidal rise: Negligible.

7B-16 Hudiksvall is located at the head of Hudiksvallsfjärden, nearly 15 miles northwestward of Agön Light.

Navigation.—See section 7A-4.

Ice.—Ice usually obstructs navigation from the middle of December until the end of April.

Currents.—See section 7B-13.

Depths.—The least depth in the approach channel from seaward to the anchorage off the harbor of Hudiksvall is 32 feet, passing eastward of Ljusgrundbanken and Sandgrund. The harbor has depths of 23 to 39 feet.

Harbor.—There is anchorage in depths of 4¼ to 14¾ fathoms, mud, in the road southward and eastward of Kastellholmen, an islet lying in the entrance of the harbor. Vessels can also anchor in the harbor, northwestward and southwestward of Kastellholmen. Quays and wharves border the harbor. A line-throwing apparatus is maintained at Hudviksvall.

Pilots.—See section 7B-14. Vessels of over 100 tons (net) are required to employ a harbor pilot when entering the harbor or shifting berth.

Directions.—See section 7B-15.

7B-17 Hudiksvall is a town with a population of about 12,000 (1959). The principal exports are timber, wood pulp, and iron. There is a customhouse in the town.

The total length of quayage in the port is about 2,155 feet. Stenkajen, the principal quay, is 1,312 feet long and has depths of 13 to 24½ feet alongside. An oil pier in the northern part of the harbor is about 195 feet long with a depth of 33 feet alongside. The other quays and wharves have depths of 6½ to 19½ feet alongside. Cargo is worked with ship's gear. Stenkajen and a coal wharf are connected to the general railroad system. Tugs are available.

Provisions, coal, and fuel oil can be obtained. Water is supplied from a hydrant near the customhouse or can be delivered by water boat. Minor repairs can be made; there is a small marine railway for tugs and lighters. Regular steamer service is maintained with Stockholm and other Swedish ports. Hudiksvall is connected to the general railroad system. A hospital is available.

ANCHORAGES

7B-18 Sundsmars Redd.—See section 7B-5.

Lilljungfruns Redd.—See section 7B-9.

Kråksundet.—See section 7B-13.

Olmsundet.—See section 7B-14.

Southward of Norra Ljusgrund.—See section 7B-14.

Numerous other anchorages, lying in the various inlets indenting this coast, are described with the related features.

Part C. HORNSLANDET TO ÅSTHOLMSUDDE

7C-1 Hornslandet (*Hornsudde*, 61°37' N., 17°29' E.) is described in section 7B-13.

COAST—GENERAL

7C-2 From Hornslandet the coast trends generally northward about 140 miles to Åstholmsudde, the southern point of Åston (sec. 7D-1). It is mostly high and wooded, with a number of hills rising inland and visible from seaward. Glarsberget, about 7

miles west-southwestward of Stocka (sec. 7C-6), is 610 feet high, and is distinguished by several summits, of which the northern is the highest. Vättberget, about $1\frac{1}{2}$ miles westward of the head of Sörfjärden (sec. 7C-7), is 302 feet high. Orraklinten, 5 miles westward of Galtström (sec. 7C-7), is 794 feet high, and is steep on its northern side; from southward it appears to have three summits of about equal height. Midskogsberg, about $4\frac{1}{2}$ miles southward of Sundsvall, is 804 feet high, and slopes steeply on its southern side; it is conspicuous from southeastward. Nolbykullen (Nordbyknöl), about $2\frac{1}{4}$ miles east-southeastward of Midskogsberg, is 591 feet high; it is flat-topped and has a steep slope on its southern side.

Between the northern extremity of Hornslandet and Vitskär (Hvitskär), an islet lying close to shore about $4\frac{3}{4}$ miles northward, all dangers are within 1 mile of the coast. Between Vitskär and Lörudden, a point about 26 miles north-northeastward, there are several islands and a number of dangers, the outermost of which lies about $7\frac{1}{2}$ miles offshore. Most of these islands and dangers rise abruptly from deep water.

Sundsvallsbukten, an extensive bay, is entered between Lörudden and Åstholmsudde. A considerable portion of the inner part of this bay is occupied by one large and several small islands.

The principal port between Hornslandet and Åstholmsudde is Sundsvall, about 13

miles northwestward of Lörudden. There are a number of small harbors and loading places throughout this area.

DEPTHS—OFF-LYING ISLANDS AND DANGERS—OUTLYING BANK

7C-3 Depths of 30 to 40 fathoms are found 3 to 4 miles offshore on much of this section of coast. The depths, both near the coast and offshore, are very irregular. A depth of $6\frac{1}{2}$ fathoms is found in the midst of depths of 20 to 30 fathoms about 37 miles eastward of Bålsön.

Bålsön, a wooded island, lies about $\frac{1}{2}$ mile off the northeastern point of Hornslandet. Bålsösund, which separates the island from the mainland, is much encumbered with rocks and shoals. A channel through Bålsösund will accommodate vessels with a draft of 15 feet. This channel is marked by spar buoys and two pairs of lighted range beacons, but vessels should not use it without a pilot. A submarine cable crosses Bålsösund. Bålsön should be given a berth of 1 mile on the northern and southern sides, and $\frac{1}{2}$ mile on the eastern side.

Bålsön Light is shown on Gåshällan, a rock lying near the southeastern side of Bålsön. A fishing light is shown occasionally on the western side of Bålsön.

Remmarharet, a rock above water, lies about $1\frac{3}{4}$ miles north-northeastward of Vitskär. A $2\frac{1}{2}$ -fathom patch and a $1\frac{1}{2}$ -

fathom patch lie, respectively, about $\frac{1}{3}$ mile southeastward and $\frac{1}{2}$ mile northwestward of Remmarharet. Two rocks above water lie about $\frac{1}{2}$ mile west-southwestward of Remmarharet. Britas Klack, a $3\frac{1}{4}$ -fathom patch, marked on its southern side by a buoy, lies in the approach to Stocka Hamn (sec. 7C-6), about $2\frac{3}{4}$ miles northward of Remmarharet, and Norra Korvgrund, a rock above water, lies about $1\frac{3}{4}$ miles farther northward. Several shoal patches lie between Norra Korvgrund and Norra Gullgrund, a 4-fathom patch lying about $1\frac{1}{4}$ miles southeastward.

Jättholmarna lying about $4\frac{1}{2}$ miles northeastward of Stocka Hamn, consists of two wooded islands separated by a narrow channel. Rocks above water lie up to $\frac{1}{8}$ mile off the southwestern point of the western island, and a number of shoal patches lie within about 1 mile northeastward of the eastern island. Simpgrund, a 3-fathom shoal, lies about 1 mile northeastward of the island.

Vitörarna (Hvitörarne), lying about $1\frac{1}{4}$ miles northward of Jättholmarna, consists of two islets separated by a narrow channel. The northern islet is the larger and is mostly wooded; the southern is almost bare. Sörskäret Light is shown on the southern islet. Foul ground and shoal patches lie within $\frac{1}{2}$ mile of the northern and eastern sides of Vitörarna, and a $4\frac{1}{4}$ -fathom patch lies about $\frac{1}{4}$ mile northeastward of the northeastern point of the northern islet.

Gran is a wooded islet lying about 4 miles northeastward of Jättholmarna. Gran Light is shown on the western side of the islet. A submarine cable extends from Gran to the mainland. A $6\frac{1}{2}$ -fathom patch lies about $1\frac{3}{4}$ miles east-northeastward of Gran Light. A $5\frac{1}{4}$ -fathom patch and a 4-fathom patch lie about $1\frac{3}{4}$ and 2 miles west-northwestward of Gran. Yttre Storgrund, a 2-fathom patch marked by a spar buoy on its southern side, lies about $2\frac{1}{2}$ miles westward of Gran. Norra

Myran, a rock with a depth of 3 fathoms, lies about $2\frac{3}{4}$ miles west-northwestward of Gran. A 3-fathom patch lying about $\frac{1}{4}$ mile northwestward of Norra Myran is marked on its northwestern side by a spar buoy.

Lillgrund consists of several patches, the easternmost of which, with a depth of 1 fathom, lies about $2\frac{3}{4}$ miles northeastward of Gran, and is marked on its southeastern side by a buoy. The westernmost patch, awash, lies about $1\frac{3}{4}$ miles north-northeastward of Gran, and is marked on its northwestern side by a buoy.

Hundgrund, with a least depth of $3\frac{1}{2}$ fathoms, lies about 7 miles northeastward of Gran. It is marked on its northeastern side by a buoy.

Brämön, a high and thickly wooded island, lies southeastward of Lörudden, and is separated from the coast by a sound nearly 1 mile wide.

Brämön Light ($62^{\circ}13' N.$, $17^{\circ}45' E.$) is shown on the northeastern point of Brämön. A fog signal is sounded and a radiobeacon transmits. Brämökälv Light is shown on Brämökälv (Bremökalf), an islet close off the southern end of Brämön.

Dangers lying near the coast, and in the approaches to ports and loading places, are described with the related features.

NAVIGATION

7C-4 Vessels bound northward on the coastal track and having arrived at a position about $1\frac{3}{4}$ miles eastward of Agön Light (sec. 7B-3) may steer a course of 015° for about 53 miles to a position about $7\frac{1}{2}$ miles eastward of Ästholsudde (sec. 7D-1). This track makes its closest coastal approach off Agön; it leads over a least depth of 21 fathoms, and passes about $\frac{3}{4}$ mile eastward of Hundgrund.

COASTAL FEATURES—LANDMARKS

7C-5 Arnöviken, an inlet lying on the northwestern side of Hornslandet, is a good harbor of refuge, with depths of 11 to 13½ fathoms, sand and mud, at the anchorage. The entrance channel will accommodate vessels with a draft of 26 feet. Halvarskär, a small islet, lies on the western side of the entrance. A light is shown on the eastern side of Halvarskär. A 4½-fathom patch and a 4-fathom patch marked by spar buoys, lie, respectively, about ¾ mile east-northeastward and 300 yards eastward of the light structure on Halvarskar; the fairway lies between these two dangers. A 3 1/2-fathom patch lies about ¼ mile southwestward of the islet. Ice usually obstructs Arnöviken from November to May. Pilots are obtained from Holick.

A fishing light is shown on the coast westward of Vitskär.

STOCKA HAMN

7C-6 Stocka Hamn (Stockvik), a loading place about 11 miles north-northwestward of Bålsön, is well-sheltered by two islets and some shoals in the entrance, and by five short breakwaters. Several shoals lying on both sides of the approach to the harbor, westward of Britas Klack, are marked by spar buoys, some being equipped with radar reflectors. A number of shoal patches lie up to 2¼ miles northeastward of Stocka Hamn. Hammargrund, a 3-foot patch lying about 1¾ miles east-northeastward of the entrance, is marked by a spar buoy. The principal entrance channel, which will accommodate vessels with a draft of 19 feet, leads into the harbor between Ingaskär, the southern islet in the entrance, and the head of a breakwater extending northeastward from the shore. A channel lying northward of Ignaskär is very narrow. **Stocka Beacon**, stands on Ingaskär. A conspicuous chimney stands at Stromsbruk, about 1¾ miles southwestward of Stocka Beacon.

The harbor area available to vessels is small and has depths of 18 to 21 feet, clay and stones. Ice usually obstructs the harbor from December to April.

The rescue vessel Emanuel Högberg is stationed in Stocka Hamn. It is equipped with radar and upon request, can assist in position finding during fog and bad weather.

A light is shown on Ingaskär. Three pairs of range lights mark the channel into the harbor.

Pilots.—Pilots can be obtained from the pilot station at Holick. For general information regarding pilotage in Swedish waters, see section 1-25.

Directions.—Vessels should steer for Stocka Beacon on a bearing of 284°, passing southward of Britas Klack and the dangers westward of it on the northern side of the fairway. When about 1 mile from the beacon, they should proceed into the southern entrance channel, being guided by the buoys and range lights.

Stocka, with a population of about 2,000, stands on the southern side of the harbor. The principal exports are wood pulp and timber. A custom station is open during the navigating season. There is a quay about 558 feet long, with depths from 6 to 18 feet alongside; a 5-ton crane is on the quay. A rail line runs along the shore directly behind the quay. About 800 tons of wood pulp per day can be loaded at Stocka. Tugs are available. Provisions, water, and fuel oil can be obtained. Minor repairs can be made; there is a marine railway for small vessels.

COASTAL FEATURES—LANDMARKS
(Continued)

7C-7 Jättendalsfjärden, an inlet entered about 2¾ miles northward of Stocka Beacon, affords anchorage to small vessels with local knowledge. A 3¾-fathom patch lies in the

approach to Jättendalsfjärden, about $2\frac{1}{4}$ miles north-northeastward of Stocka Beacon. A 3-foot patch lies close southeastward of the southwestern entrance point, and an 11-foot patch lies on the southern side of the entrance. Vessels with a draft of $14\frac{1}{2}$ feet can pass through a narrow channel, marked by spar buoys, to the harbor at the head of the inlet. There are depths of 9 to 16 feet, mud and stone, in the harbor, which is partly sheltered by the islet of Notholm. A light is shown on the western side of Jättendalsfjärden, about $\frac{1}{2}$ mile from its head. Three pairs of range lights at the head of the inlet mark the channels to the anchorage and to an adjacent fishing harbor. Ice obstructs navigation from November to May. Pilots are obtained from Holick.

Jättendal, a loading place at the head of Jättendalsfjärden, has a quay 196 feet long, with a depth of 16 feet alongside. Provisions and water can be obtained.

Härtefjärden (Härthe Fjärd) is entered about $2\frac{1}{4}$ miles northward of Jättendalsfjärden. Härteskär, a small islet, lies in the middle of the entrance, and a $2\frac{1}{4}$ -fathom patch lies about $\frac{3}{4}$ mile eastward of Härteskär. There is anchorage in Härtefjärden in a depth of $5\frac{1}{2}$ fathoms, fine sand. The channel to the anchorage lies on the southwestern side of Härteskär and will accommodate vessels with a draft of 23 feet. The anchorage is open to winds from east to south.

Sörfjärden (Gnarp Fjärd) is entered about 5 miles westward of Gran. A $2\frac{1}{4}$ -fathom patch, marked on its southern side by a spar buoy, and a $2\frac{3}{4}$ -fathom patch, marked on its eastern side by a spar buoy, lie about $\frac{1}{2}$ mile east-southeastward and 1 mile east-northeastward of the northern entrance point of Sörfjärden. Remmargrund, above water, lies on the northern side of Sörfjärden, nearly $\frac{1}{2}$ mile southwestward of the northern entrance point.

Gnarp ($62^{\circ}02'N.$, $17^{\circ}26'E.$), a loading place on the northern side of Sörfjärden, has a small, narrow harbor with a depth of 13 feet, sand which is open to easterly and southeasterly winds. A channel, which will accommodate vessels having a draft of $9\frac{1}{2}$ feet, leads to the harbor, passing between Remmargrund and the northern side of the inlet. There is a quay with an available length of about 130 feet and a depth alongside of $9\frac{1}{2}$ feet. Vessels unable to enter the harbor can load outside, where there is greater depth. Ice usually obstructs the harbor from November to May. Pilots can be obtained from Holick or Spikarna.

Between Sörfjärden and Galtström, about $8\frac{1}{2}$ miles northward, a number of dangers lie within $\frac{3}{4}$ mile of the coast. Two range lights are shown occasionally at a fishing harbor about 7 miles northwestward of Gran Light (sec. 7C-3).

Galtström is a loading place at which is a quay about 330 feet long, with depths of 9 to 16 feet alongside. In Lubban, an inlet entered eastward of Galtström, there is a well-sheltered anchorage with a depth of about 5 fathoms, clay. Three shoals in the approach to Lubban are marked by spar buoys. The channel leading to the anchorage will accommodate vessels with a draft of $14\frac{1}{2}$ feet; it is narrow and winding, and should not be entered without a pilot. Pilots can be obtained from Spikarna.

Furuskärsfjärden (Furuskärshamn), entered about $1\frac{1}{4}$ miles northeastward of Galtström, affords well-sheltered anchorage in depths of 13 to 26 feet, sand and clay. The anchorage lies close northwestward of Furuskär, an islet on the northeastern side of the inlet. A fishing light is shown on Furuskär. Foul ground, on which is an islet, lies within $\frac{1}{2}$ mile of the southwestern side of the approach to Furuskärsfjärden and is marked on its eastern side by a spar buoy. Several

patches, with depths of less than 5 fathoms, lie near the middle of the entrance to the inlet. A narrow channel, which will accommodate vessels with a draft of 16 feet, leads from seaward to the anchorage. Vessels should not attempt to enter without a pilot. Pilots can be obtained from Spikarna.

7C-8 Brämösund, the passage between Brämön and the mainland, is navigable for vessels of any draft. The best anchorage is about 200 yards off Sanna, a village on the western side of Brämön, in depths of $7\frac{1}{2}$ to $13\frac{1}{2}$ fathoms over a clay mixed with sand. Shoal water extends about 100 yards from shore. When letting go the anchor, vessels should have a little way on and should head toward the shore, otherwise, because of the steep slope of the bottom from the anchorage, the anchor will not hold readily. The most troublesome sea is raised by southwesterly winds. Foul ground fringes the western side of the sound. The currents in Brämösund set north-northeastward or south-southwestward, and are often strong. Two submarine cables, one of which is marked by two range lights shown close northward of Sanna, extend from the western side of Brämön to the mainland. Anchorage is prohibited within 200 yards of these cables.

Lörudden Light ($62^{\circ}14'N.$, $17^{\circ}40'E.$) is shown on Lörudden (Lörudde), the western entrance point at the northern end of Brämösund. Two range lights are shown occasionally at a fishing harbor about $1\frac{1}{3}$ miles west-northwestward of Lörudden Light.

SUNDSVALLSBUKTEN

GENERAL REMARKS

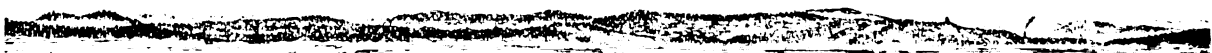
7C-9 Sundsvallsbukten is entered between Lörudden and Ästholsudde, a high point about $9\frac{1}{2}$ miles northward. The port of Sundsvall lies on the western side of the bay, about 13 miles northwestward of Lörudden. Alnön (Alnö), a large island in Sundsvallsbukten, is separated from the mainland to the westward by Alnösundet, which will accommodate vessels of any draft. Klingerfjärden lies between the northern end of Alnön and the head of the bay. There are numerous loading places on the mainland shores of Sundsvallsbukten and on Alnön. Loading places are also located in the mouth of Ljungan, a small river entering the bay south-southwestward of Alnön. At most of the loading places vessels usually lie at anchor and secure their sterns to dolphins.

A bridge with a vertical clearance of 131 feet spans Alnösundet about 3 miles north-eastward of Sundsvall. The 230-foot channel between the bridge pillars is marked by lights.

NAVIGATION

7C-10 Vessels approaching Sundsvallsbukten from southward, and having arrived at a position on the coastal track about $7\frac{1}{4}$ miles south-southeastward of Brämön Light (sec. 7C-3), may steer a course of 349° for about $6\frac{3}{4}$ miles to a position about $1\frac{1}{2}$ miles eastward of that light. This track leads over a least charted depth of 30 fathoms and passes about $\frac{3}{4}$ mile eastward of the spar buoy marking Hundgrund (sec. 7C-3).

Vessels approaching from northward, and having arrived at a position on the coastal track about $2\frac{1}{4}$ miles southeastward of



Norbykullen

Hambergsudden

Draghällan Light
bearing 300° , 4.5 miles.

Alnön, south point.

APPROACH TO SUNDSVALL FROM SOUTH—EASTWARD

From Swedish Sailing Directions

Lungö Light (sec. 7D-6), may steer a course of 218° for about 17 $\frac{3}{4}$ miles to a position about $\frac{1}{2}$ mile southeastward of Ästholmsudde (sec. 7D-1). This track leads over charted depths of more than 30 fathoms and clears all dangers.

ISLETS AND DANGERS—BANK

7C-11 Kattgrundet (Kattgrund), a bank lying off the entrance of Sundsvallsbukten, has a least depth of 13.8 m (7 $\frac{1}{2}$ fms.) about 2 $\frac{3}{4}$ miles north-northeastward of the northwestern extremity of Bramon.

Juniskaren, a group of islets, lies near the coast about 5 $\frac{1}{2}$ miles northwestward of Lorudden. Sjogrund, an 8.2 m (4 $\frac{1}{2}$ fms.) patch, lies about 2 $\frac{1}{2}$ miles east-northeastward of Skigan, the southernmost islet of the group, and is the outermost of several dangers lying eastward of Juniskaren. A spar buoy is moored on the eastern side of Sjogrund. Storgrund, awash, lies about $\frac{3}{4}$ mile north-eastward of Graskarsbadan (Graskal), an islet lying about $\frac{3}{4}$ mile eastward of Skigan. A 5.5 m (3 fm.) patch lies about $\frac{2}{3}$ mile south-southeast of Graskarsbadan. Knuten, with a least depth of 2.6 m (1 $\frac{1}{4}$ fms.) lies about 1 $\frac{1}{2}$ miles north-northeastward of Graskarsbadan. A spar buoy is moored about $\frac{1}{2}$ mile eastward of it. A 0.6 m (2 ft.) patch lies between Storgrund and Knuten.

Draget and Snoskar are, respectively, the southernmost and northernmost islets of a group extending nearly two miles southward from the southeastern point of Alnön. A 6.1 m (3 $\frac{1}{4}$ fm.) shoal and a 2.5 m (1 $\frac{1}{4}$ fm.) shoal lie about $\frac{1}{4}$ mile south-southwestward and west-southwestward of Draget. These shoals are marked on their southwestern sides by spar buoys. A 9.1 m (5 fm.) patch lies about 1 $\frac{1}{2}$ miles eastward of the northern point of Snoskar, and a 6.6 m (3 $\frac{1}{2}$ fm.) shoal, marked by a spar buoy, lies about $\frac{1}{3}$ mile east-northeastward of the same point.

Draghallan is a rock lying about $\frac{3}{4}$ mile southward of the southwestern extremity of Alnön. A spar buoy marks a shoal, with a least depth of 2.5 m (8 ft.), extending south-eastward from Draghallan, and another spar buoy marks a 6 m (19 ft.) patch lying close northeastward of that rock. Raholmsgrund Beacon, stands on a rock awash lying about $\frac{1}{2}$ mile northward of Draghallan. An 8 m (4 $\frac{1}{4}$ fm.) patch lies about $\frac{1}{4}$ mile south-eastward of this beacon.

Rodon, 302 feet high, is the largest of several islets lying off the eastern side of Alnön. Storkalven lies close northwestward, and Granon lies about 1 $\frac{1}{2}$ miles north-northwestward of Rodon. A 2.3 m (1 $\frac{1}{4}$ fm.) patch lies nearly $\frac{1}{2}$ mile westward of Ästholmsudde Light. Rodskar, a rock above water, lies about 2 miles west-northwestward of Ästholmsudde Light.

Other islets and dangers, some of which are described with related features, lie between Alnön and the western, northern, and eastern sides of Sundsvallsbukten. Dangers adjacent to channels are marked by spar buoys in accordance with the uniform system.

CHANNELS

7C-12 From seaward, vessels with a draft of 32 feet can proceed to Sundsvall and the loading places in Alnösundet and the mouth of Ljungan, passing either through Brämösund or outside Bramon, and between Knuten and the shoal south-southwestward of Draget. Another channel for vessels of the same draft leads between Snoskar and the south-eastern point of Alnön. These channels pass southward of Draghallan, but vessels with a draft of not more than 26 feet can pass between Raholmsgrund and Draghallan. From the northern end of Alnösundet, vessels with a maximum draft of 32 feet can proceed to the loading places in Klingerfjärden.

A channel for vessels with a maximum draft of 32 feet leads into Klingerfjärden, eastward of Alnön, passing eastward and

northward of Rödön, and southward and westward of Granön. Another channel, for vessels with a draft of not more than 13 feet, passes between Rödön and Alnön, and joins the deeper channel southwestward of Granön.

Cautions.—Sundsvallsbukten and the approaches to Sundsvall are enclosed within a protected area. Foreign vessels must remain within the generally used channels and are advised that local regulations may limit layover time within the area to a maximum of seven days.

During the winter, an ice-free channel for ferries is maintained in Alnösundet, between Alnö and Alvik, on the western side of Alnön, and the mainland. Vessels are prohibited from crossing this channel at a speed greater than the minimum required for safe navigation.

During fog or hazy weather when the ferries are crossing, a fog signal is sounded from each of the landing places.

Defensive Area.—A defensive area lies between the southwestern extremity of Alnön and Hambergssudden, a point on the mainland nearly 1 mile westward of Draghallan Light. The area extends eastward as far as Draghallan; surface navigation is permitted but anchorage and fishing are prohibited due to the possible presence of bottom mines. During thunderstorms passage through the area may be dangerous.

Anchorage is prohibited in the vicinity of several submarine cables and a pipe line, which are laid across Alnösundet, and are marked by lights and beacons.

Anchorage is prohibited near submarine cables extending across the channel between Alnön and the mainland eastward, about 1½ miles north-northwestward of Granön.

Submarine cables extend southeastward from the southeastern extremity of Alnön to Snöskär and Storholm, an islet about ½ mile southeastward of Snöskär. A submarine cable also extends from Storholm southwestward across Sundsvallsbukten to the mainland. Two other submarine cables extend from Draghallan southwestward to the mainland.

MAGNETIC DISTURBANCES

7C-13 Abnormal magnetic disturbances are found in the vicinity of Sundsvallsbukten,

especially in the channel eastward of Alnön. (Sec. sec. 1-9.)

WATER LEVEL

7C-14 The greatest extremes of water level observed in Sundsvallsbukten are about 2½ feet above and 3½ feet below mean sea level. High water occurs with easterly and southeasterly winds, and low water with northerly and prolonged north-northeasterly winds.

ICE

7C-15 Ice usually obstructs navigation from the middle of January to the beginning or middle of April. Following a severe winter, the ice remains later.

NAVIGATIONAL AIDS

7C-16 Draghallan Light (62°20' N., 17°27' E.) is shown from a structure standing on Draghallan. A fog signal is sounded and the structure is equipped with a radar reflector.

A light is shown at Spikarna; a fishing harbor, about 2½ miles northeastward of Draghallan Light.

Gubben Light and Rodogubben Light are shown on islands of the same names about 4 miles east-northeastward and 5 miles north-eastward, respectively, of Draghallan Light.

Åstholmsudde Light is shown on the southern extremity of Åstholmsudde. A white beacon with a red band stands close northward of the lighthouse.

Lights are shown on the western side of Tjuvholmen (Tiufholm), an islet lying in the entrance of Sundsvallsfjärden (sec. 7C-24); on Gistaholmen, an islet in the western part of Klingerfjärden; and on the western side of Granön.

Sundsvallsbukten Lighted Whistle Buoy, is moored about 1 1/2 miles east-northeastward of Gubben Light.

Lighted navigational aids are also shown at some of the landing places in Sundsvallsbukten, and are placed to mark cables and pipe line crossings.

An AERONAUTICAL RADIOBEACON transmits close southwestward of the northeastern extremity of Alnon. A LIGHT for the use of aircraft is located about 11 miles westward of Astholmsudde Light.

ANCHORAGE

IN KLINGERFJARDEN, vessels can anchor in depths of 16.4 to 46 m (9 to 25 fms.), sand and clay.

PILOTS

7C-18 Pilots for Sundsvall, Harnosand and the loading places in Sundsvallsbukten are stationed at Spikarna, near the southeastern extremity of Alnon. The station is equipped with radar and radiotelephone. Pilots meet vessels about 2 1/2 miles eastward of Gubben. For general information regarding pilotage in Swedish waters see sec. 1-25.

DIRECTIONS

7C-19 Vessels approaching Sundsvall and the loading places in its vicinity from southward, and having arrived at a position about 1 1/2 miles eastward of Bramon Light,

should bring Gubben Light ahead, bearing 324°, until course can be altered to bring Draghallan Light to bear 293°, then steer for it on that bearing, passing northward of Sjögrund and Knuten, and southward of the shoals off the southern end of Draget. When within about 1/2 mile of Draghallan Light, vessels should steer to pass about 400 yards southward of the lighthouse, then steer for the light structure on Tjuvholmen, bearing about 327°. When approaching Tjuvholmen, care is necessary to clear Fabogrund, a shoal extending from the shore of the mainland, southward of Tjuvholmen. A spar buoy marks the extremity of this shoal. When nearing Fabogrund, deep-draft vessels should alter course a little northward to clear a 9.1 m (5 fm.) patch lying nearly 3/4 mile south-southeastward of Tjuvholmen.

Vessels approaching Sundsvallsbukten from northward and having arrived at a position about 1/2 mile southeastward of Astholmsudde Light, should round Astholmsudde and proceed westward on a line between Astholmsudde and Draghallan. Thence steer for Hambergsudden bearing 252°. After pass-

ing between the spar buoys marking the 6.7 m (3 3/4 fm.) shoal east-northeastward of Snoskar and a shoal lying about 1/2 mile north-northeastward of the same islet, vessels should steer to pass between Draghallan and the 8.2 m (4 1/2 fm.) patch lying about 1/4 mile southeastward of Raholmsgrund Beacon, and thence proceed as previously directed.

Vessels bound for Klingerfjorden can use the channel on either side of Rodon, and pass westward of Granon, or they can approach through Alnosundet, but a pilot is necessary when using these channels.

LOADING PLACES IN LJUNGAN ENTRANCE

7C-20 STOCKVIK, on the western side of the river entrance, about 2 miles westward of Draghallan Light, has a quay about 640 feet long with a depth of 7 m (23 ft.) alongside. There are two 6-ton cranes and one 8-ton crane. Vessels usually load at the quay. Provisions can be obtained.

VAPELNAS, about 1/2 mile southward of Stockvik, has a small quay with a depth of 5.5 m (18 ft.) alongside and a depth of 7.9 m (26 ft.) about 30 feet off the quay.

SVARTVIK, about 3/4 mile southward of Vapelnas, has about 1,900 feet of quayage, with depths of 4.9 to 7.9 m (16 to 26 ft.) alongside. There is one 5 1/2-ton crane.

KLAMPENBORG, on the eastern side of the river entrance, opposite Vapelnas, has depths of 3.3 to 5.8 m (11 to 19 ft.) alongside its quay and 4.2 to 7.9 m (14 to 26 ft.) at dolphins.

SODRA NYHAMN (Nyhamn), close southward of Klampenborg, has about 600 feet of quayage with depths of 6.7 to 15.8 m (22 to 52 ft.) alongside. A 25-ton crane is available.

ESSVIK, close southward of Sodra Nyhamn, has one pier with a depth of 8.9 m (29 1/2 ft.) at its head and three piers with a depth of 5.8 m (19 ft.) at their heads. A quay, 246 feet long, has a depth of 4.3 m (14 1/2 ft.) alongside. There is one 1/2-ton crane. Vessels usually load at anchor.

LOADING PLACES ON THE WESTERN SIDE OF ALNOSUNDET

7C-21 TUNADAL, about 1 3/4 miles northward of Tjuvholmen, has a quay about 780 feet long, with depths of 2.5 to 7.4 m (8 1/2

to 24 1/2 ft.) alongside. A second quay with a berthing length of 66 feet, has a depth of 5.8 m (19 ft.) alongside. Large vessels anchor and secure their sterns to dolphins, at which the depths are 3.3 to 7.7 m (11 to 25 1/2 ft.). Cargo is loaded from lighters.

JOHANNEDAL lies about 1 mile northward of Tunadal. At this loading place, deep-draft vessels usually anchor and secure their sterns to dolphins, loading from lighters. Depths of the dolphins are 4.9 to 11.9 m (16 to 39 ft.). Vessels with lesser draft can find berths alongside about 640 feet of quayage in depths of 4.5 to 10.9 m (15 to 36 ft.). Provisions can be obtained. Water is supplied by water boat.

SUND (Sundsbruk), about 1 1/2 miles north-northwestward of Johannedal, has a quay about 328 feet long, with depths of 2.9 to 5 m (9 3/4 to 16 1/2 ft.) alongside. Large vessels anchor and secure their sterns to dolphins, loading from lighters. Depths at the dolphins are 5.3 to 8.9 m (17 1/2 to 29 1/2 ft.). Tugs are available. Provisions and water can be obtained. Minor repairs can be made. There is a marine railway for small vessels.

SKONVIK, about 1 mile northwestward of Sund, has a pier with a depth of 6.1 m (20 ft.) at its head. Vessels load from lighters. Tugs are available. Provisions can be obtained.

Ostrand, close northward of Skonvik, has about 2,200 feet of quayage with depths of 1.5 to 7.9 m (5 to 26 ft.) alongside. One 2-ton and two 6-ton cranes are available. Railroad tracks are laid near the quays and connect with the general railroad system. Provisions and water can be obtained.

LOADING PLACES ON THE NORTHERN AND EASTERN SIDES OF KLINGERFJORDEN

7C-22 VIVSTAVARV (Wifsta), northward of the northwestern point of Alnon, has about 1,160 feet of quayage with depths of 5.2 to 7.4 m (17 to 24 1/2 ft.) alongside. There is one 5-ton crane. There are dolphins with adjacent depths of 6.5 to 14 m (21 to 46 ft.). Vessels usually load from lighters. Tugs are available. Provisions can be obtained. Minor repairs can be made.

FAGERVIK, about 1/2 mile northeastward of Vivstavav, has a pier 384 feet long, with about 755 feet of berthing space and depths

of 18 to 24 1/2 feet alongside. A second pier has about 300 feet of berthing space and a depth of about 24 feet alongside. The area between the two piers has been dredged to 28 feet. Vessels usually load from lighters. Tugs are available. Minor repairs can be made.

SORAKER, on the eastern side of **Klingerfjorden**, about 2 1/2 miles eastward of **Fagervik**, has about 830 feet of quayage, with depths of 7 1/2 to 18 feet alongside. There is also a pier about 280 feet long, with depths of 9 3/4 to 19 feet alongside. Vessels can anchor and secure their sterns to dolphins, loading from lighters. Depths at the dolphins are 15 to 23 feet. A channel leading to the quay is indicated by two **RANGE LIGHTS**. A **LIGHT BUOY** marks the outer end of an underwater tube extending about 175 yards from the quay. There are two cranes of 1 and 7 1/2 tons lifting capacity. Provisions and water can be obtained.

LOADING PLACES ON ALNON

7C-23 MYRNAS, about 2/3 mile eastward of **Tjuvholmen**, has a small pier with a depth of 18 feet at its head. Vessels anchor and secure their sterns to dolphins, at which are depths of 14 to 18 feet.

KARLSVIK, close northward of **Myrnas**, has a pier with a berthing length of about 250 feet with depths alongside of 11 to 21 feet. Vessels anchor and secure their sterns to dolphins at which are depths of 25 1/2 to 37 1/2 feet. Provisions and water can be obtained.

LERVIK, about 2/3 mile northward of **Karlsvik**, has a quay with a depth of about 6 1/2 feet alongside. Vessels anchor and secure their sterns to dolphins. Cargo is loaded from lighters. Provisions and water can be obtained.

ALVIK, about 1 3/4 miles northward of **Lervik**, has about 200 feet of quayage, with depths of 9 to 16 feet alongside. Vessels usually anchor and secure their sterns to dolphins, loading from lighters. The depths at the dolphins are 19 1/2 to 32 1/2 feet. Provisions and water can be obtained.

NYVIK, about 2 miles north-northwestward of **Alvik**, has a quay 410 feet long, with depths of 24 1/2 to 32 1/2 feet alongside, and about 330 feet of quayage with depths of 7 1/2 to 13 feet alongside. The quays are in poor condition.

HOVID, about 1 mile north-northwestward of **Nyvik**, has a quay about 525 feet long, with depths of 5 to 17 feet alongside. There are also two small piers with least depths of 24 1/2 and 27 1/2 feet alongside their heads. Vessels usually anchor and secure their sterns to dolphins, at which are depths of 20 to 36 feet. Provisions and water can be obtained.

SUNDSVALL

Position: 62° 23' N., 17° 19' E.

Depths: Entrance channels, 6 1/2 to 13 1/2 fathoms.

Roadstead, 5 1/2 to 11 fathoms.

Berths, 9 to 37 1/2 feet.

Tidal rise: Negligible.

Port plan: See section 7C-31.

7C-24 Sundsvall is the principal port of the **Sundsvall Customs District** which comprises the numerous loading places on the mainland shores of **Sundsvallsbukten** and on **Alnon**. **Sundsvallsfjorden**, the harbor of **Sundsvall**, is entered from the southern part of **Allnosundet**. It consists of **Yttre Hamnen**, the outer harbor, and **Inre Hamnen**, the inner harbor.

NAVIGATION

7C-25 See section 7C-10.

ICE

7C-26 The harbor is usually closed by ice during February and March, but in some years it is open throughout the winter season. During severe winters the harbor is closed from the middle of January to the beginning of May.

DEPTHS

7C-27 Vessels of 40-foot draft can proceed from sea to the anchorage in Sundsvallsfjarden where there are depths of 5 1/2 to 11 fathoms. Inre Hamnen has charted depths of 23 to 39 feet, except in the northern part where the depths are 11 to 16 feet. The depths at the berths are described in section 7C-31.

HARBOR

7C-28 Entrance channels to Sundsvallsfjarden pass northward and southward of Tjuvholmen, the islet lying near the middle of the entrance. Killingholmen, another islet, lies about 700 yards north-northwestward of Tjuvholmen. There is no passage between Killingholmen and the mainland close northward. Sundsvallsfjarden is clear of dangers, and its roadstead between Tjuvholmen and Inre Hamnen affords ANCHORAGE in depths of 5 1/2 to 11 fathoms, mud and clay. Selangeran, a small river, flows into the head of the harbor which is quayed on its southern, western, and northern sides. There are several quays and wharves on both the northern and southern shores of Sundsvallsfjarden, and at the loading places of Kubikensborg, on the southern side of the entrance, and Ortvikén, on Killingholmen. Dolphins stand off some of the quays.

THE QUARANTINE ANCHORAGE, marked by yellow BUOYS, lies off the northwestern side of Tjuvholmen. Vessels bound for Sundsvall anchor here while awaiting pratique. A line-throwing apparatus is maintained at Sundsvall.

PROHIBITED ANCHORAGE.—Anchorage is prohibited on a line joining the light on Tjuvholmen with the northeastern corner of Stora Hamnkajen, the principal quay at Sundsvall.

PILOTS

7C-29 See section 7C-18.

DIRECTIONS

7C-30 See section 7C-19.

FACILITIES

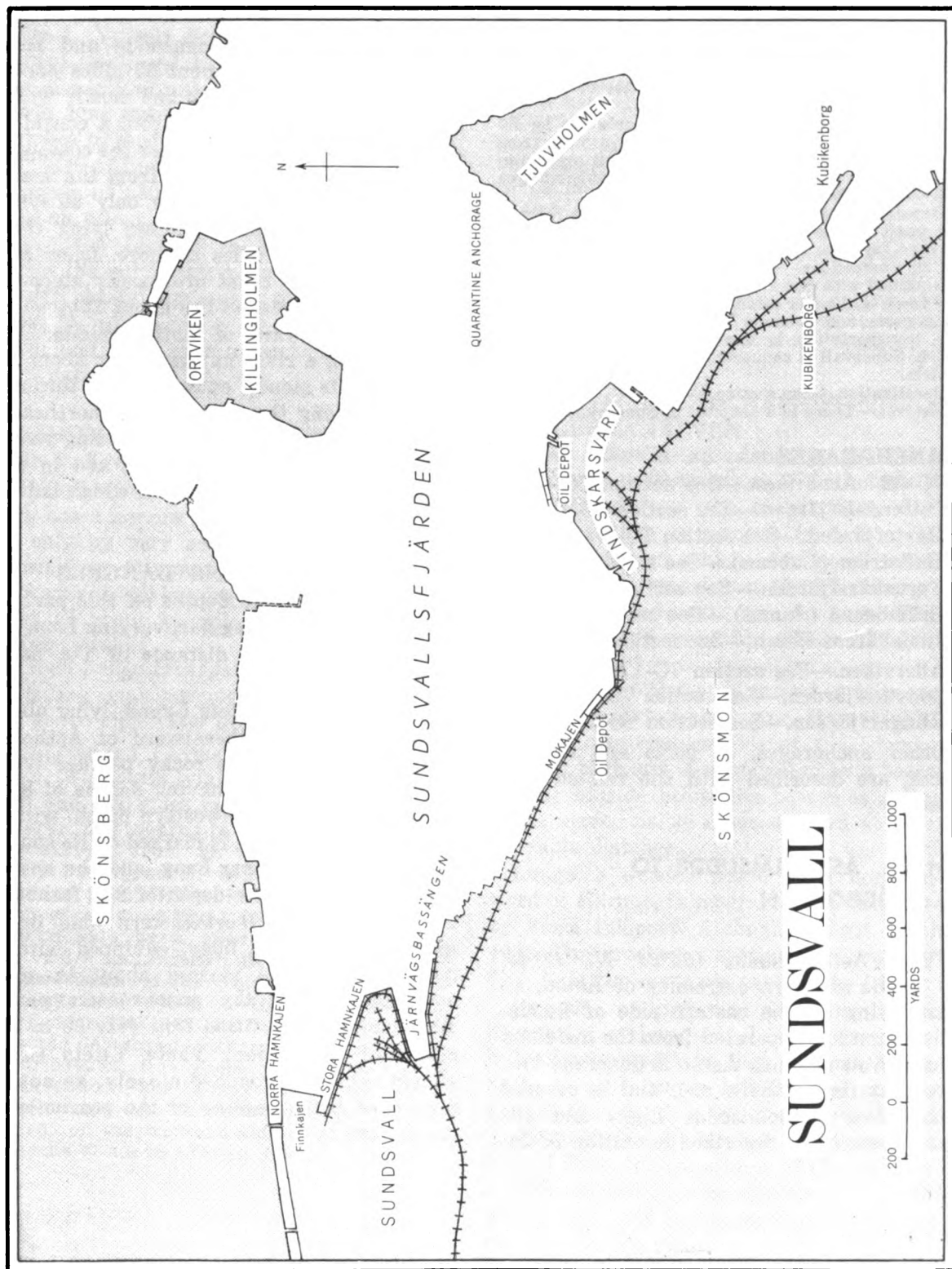
7C-31 SUNDSVALL, with a population of about 28,400 in 1958, is built around the head of Sundsvallsfjarden. It is an important manufacturing and shipping center for wood products, and numerous sawmills, and pulp and paper mills, are located in the vicinity. Lumber, wood pulp, paper, and tar are exported; coal, coke, salt, canvas, corn, wine, and brandy are among the principal imports. There is a customhouse in the town.

BERTHS.—There are about 13,000 feet of quayage within the port limits of Sundsvall. On the southwestern side of Inre Hamnen is Jarnvagsbassängen, with quays on three sides having a total length of 2,133 feet and depths of 24 1/2 to 27 1/2 feet alongside. Stora Hamnkajen, lying northward of Jarnvagsbassängen, is 1,296 feet long, with depths of 22 to 26 feet alongside. Finnkajen, southward of the river entrance, has a total length of 1,017 feet with depths of 16 to 22 feet alongside. Norra Hamnkajen, on the northern side of the head of the harbor, is 1,394 feet long, with a depth of 16 feet alongside.

Mokajen, on the southern side of Sundsvallsfjarden, has 1,050 feet of quayage with a depth of 16 1/2 feet alongside. At Vindskarsvarv, on the southern side of the harbor and eastward of Mokajen, there are quays with a total length of 820 feet and 37 1/2 feet alongside. Oil depots are located at Mokajen and Vindskarsvarv.

Kubikensborg has a quay about 500 feet long with a depth of 24 feet alongside. There is also about 1,470 feet of quayage, with depths of 9 1/2 to 18 feet alongside, off which large vessels anchor and moor to dolphins. The depth at the dolphins is about 26 feet. Cargo is loaded from lighters.

Ortviken paper mills on Killingholmen has about 525 feet of quayage with 32 to 36 feet alongside and 810 feet of quayage with 19 to 29 feet alongside. Other quays have 9 feet or less alongside. The oil berths at Ortvikén have alongside depths of 14 feet and 36 feet.



Railroad tracks, connecting with the general railroad system, are laid on most of the quays on the southern side of the harbor. There are 8 cranes, with lifting capacities of $\frac{1}{2}$ ton to 10 tons, on the quays, and two floating cranes with capacities of 2 and 4 tons. Tugs and lighters are available.

Supplies.—Provisions and ship's stores can be obtained. Water is supplied from quays and from water boats. Supplies of coal and fuel oil are maintained. The coaling berths are at Järnvägsbassängen and Vinskärvarv.

Repairs.—Machine shops and a marine railway for small vessels are located at Vindskärvarv. Two salvage tugs are available.

Communications.—Regular steamer service is maintained with Stockholm and other Swedish ports, and there is steamer communication with other European ports and ports in other parts of the world. Air transportation is available to Stockholm and Luleå. Sundsvall is connected to the general railroad system.

Deratization.—See section 1-7.

Medical.—There is a hospital in Sundsvall.

ANCHORAGES

7C-32 Arnövikén.—See section 7C-5.

Jattendalsfjärden.—See section 7C-7.

Härtefjärden.—See section 7C-7.

Galtström (Lubban).—See section 7C-7.

Furuskärsfjärden.—See section 7C-7.

Brämösund (Sanna).—See section 7C-8.

Juniskärens Hamn.—See section 7C-17.

Allerviken.—See section 7C-17.

Bodviksfjärden.—See section 7C-17.

Klingerfjärden.—See section 7C-17.

Other anchorages, at ports and loading places, are described with the related features.

Part D. ÄSTHOLMSUDDE TO HÖGBONDEN

7D-1 Ästholmsudde ($62^{\circ}23' N.$, $17^{\circ}44' E.$) is the southern extremity of Ästön, an island lying on the eastern side of Sundsvallsbukten and separated from the mainland by a narrow channel. Ästön is generally low, except at its southern end, and is covered with trees. Ästholmsudde Light and the beacon near it are described in section 7C-16.

COAST—GENERAL

7D-2 Between Ästholmsudde and Högbonden, an islet lying about 35 miles north-eastward, the coast is high and mostly wooded. Numerous hills, visible from a considerable distance seaward, rise near the coast and on several islands separated from the mainland by narrow sounds. The only off-lying dangers are two rocky patches lying close together, about 9 miles offshore. Islets and dangers near the coast are mostly steep-to. The port of Härnösand lies about $15\frac{1}{2}$ miles north-northeastward of Ästholmsudde. Ängermanälven, a river navigable for about 20 miles from its mouth, enters the sea through channels among the islands lying northeastward of Härnösand. Numerous loading places are situated in Ängermanälven, and in the several bays, sounds, and inlets which indent the coast.

DEPTHS—OFF-LYING DANGERS

7D-3 The charted depths off this part of the coast are very irregular, varying from 30 to 65 fathoms at a distance of $1\frac{1}{2}$ miles from the shore.

Vänta (Wanta) Litets Grund, lying about $15\frac{1}{2}$ miles east-northeastward of Ästholmsudde, consists of two rocky patches lying on an extensive bank having depths of 8 to 30 fathoms. The southwestern patch, with a depth of $2\frac{1}{2}$ fathoms, is marked on its southwestern side by a spar buoy, and the northeastern patch, with a depth of $3\frac{1}{4}$ fathoms, is marked on its northeastern side by a spar buoy. A light buoy, equipped with a radar reflector, is moored about $\frac{1}{2}$ mile northwestward of the southwestern patch. This buoy is in position from July 20 to the close of navigation. Vänta Litets Grund should not be approached closely, as soundings give little warning of the proximity of the dangers.

NAVIGATION

7D-4 Vessels bound northward on the coastal track and having arrived at a position about $7\frac{1}{2}$ miles eastward of Åstholmsudde, may steer a course of 015° for about 14 miles to a position about $2\frac{1}{4}$ miles south-eastward of Lungö Light (sec. 7D-6), thence a course of 039° for about $17\frac{1}{4}$ miles to a position about $2\frac{1}{2}$ miles southeastward of Högbonden Light (sec. 7E-1). This track passes the northeastern point of Härnön, its closest coastal approach, at a distance of about 2 miles, clears all dangers on this coast, and leads over a least charted depth of 23 fathoms.

COASTAL FEATURES—LANDMARKS

7D-5 Tynderösundet, which separates the northeastern side of Åstön from the mainland, has a narrow winding channel, navigable only by very small vessels. A light is shown from Kammarskär, the southern entrance point, during the fishing season. Some rocks lie about $\frac{1}{2}$ mile east-southeastward of Kammarskär.

A road bridge crosses the channel. A center lifting span provides a clearance of 26 feet above high water level.

Åvikebukten (Åviks Bay) is entered between two points lying about 1 mile northward and $4\frac{1}{4}$ miles northeastward of Kammarskär. The depths in this bay are irregular, varying from 29 to 114 m (16 to 62 fms.). Fjardgrunden (Fiard Grund), in the southern part of the entrance, has a least depth of 3.6 m (2 fms.) and is marked on its eastern side by a spar buoy. Nygrund, a 3 m ($1\frac{3}{4}$ fms.) patch lies about $\frac{3}{4}$ mile southwestward of Skarpudden, the northeastern entrance point. A light is shown on Skarpudden. In 1967 the light-structure was reported destroyed. Isaksgrund (Isacsgrund), which breaks, lies about $\frac{1}{2}$ mile eastward of Skarpudden, and is marked by a spar buoy.

Anchorage can be obtained near Oxviksskaren, on the western side of Åvikebukten, in depths of 4.9 to 10 m ($2\frac{3}{4}$ to $5\frac{1}{2}$ fms.),

sand; near Bondhamnsskar, about $1\frac{1}{2}$ miles northward of Oxviksskaren, in depths of 4.9 to 6.7 m ($2\frac{3}{4}$ to $3\frac{3}{4}$ fms.), sand; in Sandstensfjarden, about $2\frac{1}{4}$ miles east-northeastward of Bondhamnsskar, in depths of 6.7 to 10 m ($3\frac{3}{4}$ to $5\frac{1}{2}$ fms.), sand; and in Barsviken, on the western side of Skarpudden, in depths of 10 to 24 m ($5\frac{1}{2}$ to 13 fms.), sand. Pilots for these anchorages can be obtained from Spikarna.

Byviken, a narrow inlet entered about 4 miles northeastward of Skarpudden, is clear of dangers but is open to southeasterly winds. There is anchorage in depths of 10 to 11.9 m ($5\frac{1}{2}$ to $6\frac{1}{2}$ fms.), sand and stone. Pilots can be obtained from Spikarna or Harnosand.

APPROACHES TO HÄRNÖSAND AND ÅNGERMANÄLVEN

7D-6 Härnön, an island lying about 11 miles north-northeastward of Åstholmsudde, is separated from the mainland by Södra Sundet. It has a number of tree-covered ridges, between which are deep valleys. Near the sea the sides of the hills are gray and bare, and cut by ravines. Härnö Vårdkasberg, a gray hill about $3\frac{1}{2}$ miles northward of the southwestern extremity of the island, is 574 feet high and is surmounted by a small lookout tower. Härnöklubb, a point on the eastern side of the island, is 269 feet high and is surmounted by a beacon. On the hillside below the beacon is a large white mark, visible from seaward at a considerable distance.

Lungö, a wooded island lying northeastward of Härnön, is separated from the latter by Stora Inloppet, a channel about 1 mile wide. The greatest elevation on Lungö, 164 feet, is in the northern part of the island.

Hemsön, a high and hilly island, lies northward of Lungö, and is separated from it by Lungösundet, a deep channel. Hemsöhatt, a conspicuous hill in the southern part of the island, is 682 feet high. Hultomberget, 685 feet high, rises in the northern part of Hemsön. The shores of the island are reddish-colored in several places. Two radio masts, about 259 feet high, stand on the eastern side of the island.

Utanöfjärden, on the eastern side of Hemsön, can be used as a harbor of refuge. There is anchorage in depths of 13.7 to 26 m (7 1/2 to 14 fms.), clay, in the southern part of the inlet, and in depths of 11.9 to 20.1 m (6 1/2 to 11 fms.), sand and clay, in the northern part. The channel to the anchorage is available to vessels with a draft of 19 1/2 ft. A 3.9 m (13 ft.) patch lies in the entrance. Pilots can be obtained from Harnon or Norra Ulvon (sec. 7E-4).

Storön, an island lying about 1 1/4 miles northeastward of Hemsön, is separated from the latter and from the mainland northwestward by deep channels. A group of several islets lies westward of the southern end of Storön and in the entrance of the channel which lies between the northern end of Hemsön and a peninsula of the mainland, about 1 mile northward. Submarine cables are laid between the southeastern part of Storön, the northern side of Hemsön, and the two largest islets of the group mentioned above.

Navigational aids.—Storholmen Light is shown on the southern end of Storholm, a small island close southward of Härnön.

Obstruction lights are shown on a radio mast which stands about 3 1/3 miles north-northeastward of Storholmen Light.

Härnöklubb Light is shown on the eastern side of Härnön, about 4 1/2 miles northeastward of Storholmen Light.

Härnön Södra Light is shown occasionally on the northeastern extremity of Härnön about 1/2 mile north-northeastward of Harnoklubb. A fog signal is sounded about 1/4 mile north-northwestward of Harnon Södra Light.

Härnösand Hamn Light is shown on the northwestern point of Härnön.

Lights are shown from both sides of the northern and southern entrances of the canal at Härnösand.

Lungö Light (62°39' N., 18°06' E.) is shown on the southeastern point of Lungö. A radiobeacon transmits about 4 miles north-northeastward of Lungö Light.

Strömskatan Light is shown on the western point of Lungö.

A light is shown on Grönviksgrund, a small islet lying about 1 mile westward of the northern end of Storön.

Karingbergsudde Light is shown about 1/2 mile north-northwestward of Grönviksgrund Light.

Valsudde Light is shown about 2 1/2 miles west-southwestward of Grönviksgrund Light.

An ammunition dumping ground lies about 2 miles eastward of Harnon Södra Light.

Navigation.—See section 7D-4.

The water level is usually raised by southerly and southeasterly winds, which prevail in autumn, and is lowered by northerly and northwesterly winds, which prevail in spring.

Ice is usually encountered from January to the beginning or middle of April.

Södra Sundet, the southern approach to Harnosand, has charted depths of 14.6 to 55 m (8 to 30 fms.) in midchannel. A 13.7 m (7 1/2 fm.) patch lies off the entrance, about 1 mile south-southwestward of Storholmen Light. Daggstenarna, a group of rocks above water, lies near the middle of the sound, about 1 1/2 miles northward of the southern entrance. A 3.3 m (11 ft.) patch lies close northward of Daggstenarna. A cove on the western side of Harnon, about 1/2 mile north-northeastward of Storholmen Light, affords good anchorage in depths of 10 to 29 m (5 1/2 to 16 fms.), sand and clay. Two patches with depths of 3.4 m (11 1/2 ft.) and 7.3 m (24 ft.), lie near the middle of the cove. In Falleviken (Fallevik), on the western side of the sound and about 2 miles northward of Storholmen Light, there is anchorage in depths of 10 to 20.1 m (5 1/2 to 11 fms.), clay.

Lovudden is a loading place on the mainland, about 3 1/2 miles northward of Storholmen Light. There is a pier with a depth of about 1.9 m (6 1/2 ft.) alongside. The anchorage in Norra Falloviken, about 1/2 mile south-southwestward of Lovudden, has depths of 10 to 11.9 m (5 1/2 to 6 1/2 fms.) clay. Tugs are available.

7D-7 Stora Inlopp is the principal northern approach to Harnosand and the southern approach to Angermanalven. The fairway has depths of 46 to 82 m (25 to 45 fms.), and is clear of dangers except on its northeastern side. A 1.5 m (5 ft.) patch lies about 1/2 mile west-southwestward of Lungö Light. A 1.8 m (6 ft.) patch, marked on its northwestern side by a spar buoy, lies about 3/4 mile westward of Lungö Light. Bogrund, awash,

lies near the southern side of Lungo, about midway between Lungo Light and Stromskaten Light; it is marked by three spar buoys. A submarine cable is laid across Stora Inlopp from a position on Lungo about 2/3 mile east-southeastward of Stromskaten Light.

ALANDSFJARDEN (Aland Fjord), a continuation west-northwestward of Stora Inlopp, is accessible to deep-draft vessels. Dangers on the sides of the fairway are marked by SPAR BUOYS in accordance with the uniform system. There are several loading places in the inlet.

A SUBMARINE CABLE crosses Alandsfjarden at its narrowest point, about 2 miles northwestward of Harnosand Light. A similar cable crosses the fjord about 1 1/2 miles eastward of the latter cable.

LOADING PLACES.—Alandsbro (Aland), at the head of Alandsfjarden, has an anchorage with depths of 11.9 to 14.6 m (6 1/2 to 8 fms.). Vessels anchor and secure their sterns to dolphins.

Nasslandssund, close northward of Alandsbro, has one dolphin at which the depth is 4.3 m (14 1/2 ft.); a short distance off the dolphin are depths of 11.9 to 14.6 m (6 1/2 to 8 fms.).

Ulvvik (Ulfik), on the northeastern side of Alandsfjarden, has a quay 262 feet long, with depths of 6.4 and 7 m (21 and 23 ft.) alongside. Vessels usually load at the quay. Provisions and water can be obtained. There is a repair shop.

LUNGOSUNDET, about 300 yards wide, can be used by vessels of any draft as an approach to Harnosand or Angermanalven. Bonskar, a low barren islet, lies on the northern side of the entrance. A 1.2 m (4 ft.) shoal, marked on its northern side by a spar buoy, lies on the southern side of the entrance. A submarine cable crosses Lungosundet about 1/2 mile eastward of the western entrance. Anchorage is prohibited

within 150 yards on either side of the cable. Lungosundet lies within the Hemson defense area.

THE NORTHERN ENTRANCE of Angermanalven, between the northern end of Hemson and the mainland, can be approached either northward or southward of Storon and the islets lying westward of it. Both channels will accommodate vessels of any draft. Vessels with a draft of 19 1/2 feet can pass through a channel northwestward of Hemson, and thence proceed southward through Sannaundet (sec. 7D-11) to Harnosand. Gronviksfjarden, a deep inlet, is entered about 1 1/4 miles northwestward of Storon.

HEMSON DEFENSE AREA comprises the channels and other water areas and the islands and parts of the mainland lying within a line drawn from a position on the mainland northward of Harnon to the southeastern point of Lungo, thence to the northeastern extremity of Storon, and thence northward to the mainland. The area includes the lower part of Angermanalven, as far northward as Sprangsviken (sec. 7D-18). Foreign vessels passing through this area must use the ordinary pilot channels from Angermanalven to the open sea through Lungosundet, and the entrance channels southward and northward of Storon. Vessels are advised that local regulations may limit layover time within the area to a maximum of seven days.

Surface navigation is permitted through the area but anchorage and fishing are prohibited due to the possible presence of bottom mines. During thunderstorms passage through these fairways may be dangerous.

Vessels are cautioned not to anchor in an ammunition dumping area which lies about 2 miles southeastward of Lungo Light.

PILOTS.—Pilot services may be obtained from the pilot stations at Ornskoldsvik or at Sundsvall. For general information regarding pilotage in Swedish waters, see section 1-25.

HARNOSAND

Position: 62° 38' N., 17° 56' E.
Depths: Yttre Hamnen, 14.6 to 44 m (8 to 24 fms.).
 Inre Hamnen, 3.9 to 12 m (13 to 39 1/2 ft.).
 Harnosands Kanal, 3.4 m (11 1/2 ft.).
 Sodra Hamnen (anchorage), 15.5 m (8 1/2 fms.).
 Berths, 2.4 to 9.9 m (8 to 32 3/4 ft.).

Tidal rise: Negligible.

7D-8 Harnosand, the principal port in the Harnosand Customs District, has one of the best harbors in northern Sweden, being easy of access, capacious, and well-protected against all winds. The harbor lies between Harnon and the mainland. It consists of Yttre Hamnen and Inre Hamnen. Yttre Hamnen is the roadstead northward of the town and extends to Vagnon on the opposite shore farther northeastward. Inre Hamnen consists of Norra Hamnen, northward of the town, of Sodra Hamnen, south of the town, and Harnosands Kanal joining the two.

NAVIGATION.—See section 7D-4.

ICE is an obstruction during February and March, but the port is not usually closed to navigation.

DEPTHS.—Vessels with a draft of 32 1/2 feet can proceed from sea to Yttre Hamnen, passing through either Stora Inlopp or Lungo Sundet. Vessels with the same draft can also proceed through Sodra Sundet to Sodra Hamnen. Depths are 14.6 to 44 m (8 to 24 fms.) in Yttre Hamnen and 3.9 to 12 m (13 to 39 1/2 ft.) in Inre Hamnen. Sodra Hamnen has a depth of 15.5 m (8 1/2 fms.) in its outer part. The depth in Harnosands Kanal is 2.7 to 3.3 m (9 to 11 ft.). The depths at the berths are described in section 7D-9.

HARBOR.—Yttre Hamnen affords **ANCHORAGE** to vessels of any draft; the bottom is clay. Vessels must anchor northward of a line which is a prolongation of Kronholmskajen, a quay on the western side

of Norra Hamnen. Quays and wharves line the sides of Norra Hamnen. An oil wharf lies opposite Harnosand Hamn Light. Sodra Hamnen is partially bordered by quays. Vessels can anchor in Sodra Hamnen, where the bottom is mud. The canal connecting Norra Hamnen and Sodra Hamnen is used only by small vessels and lighters.

A lifesaving station with rescue craft and line-throwing apparatus is maintained at Harnosand.

PILOTS.—See section 7D-7.

DIRECTIONS.—Vessels bound for Harnosand through Stora Inlopp, and having arrived at a position about 2 1/4 miles southeastward of Lungo Light, should steer about 292° to pass about 3/4 mile southward of Lungo Light and southward of the dangers off the southern side of Lungo. When Stromskaten Light is abeam, course should be altered westward and the northern end of Harnon rounded at a distance of about 400 yards.

Vessels approaching Harnosand through Lungosundet should pass about 1/4 mile southward of Bonskar and northward of the spar buoy marking the shoal on the southern side of the entrance. They should proceed through the sound in midchannel but should keep on the northern side at the western entrance to clear a reef, marked by a SPAR BUOY, extending from the northwestern point of Lungo, thence should steer southwestward between the western end of Lungo and the mainland, and enter Yttre Hamnen.

Vessels bound into Sodrasundet should steer for Storholmen Light, bearing 350°, passing about 1/3 mile eastward of the 13.7 m (7 1/2 fm.) patch lying southward of the entrance. When about 1/2 mile southward of Storholmen Light they should steer to pass about midway between the lighthouse and the mainland, thence keeping in the middle of the sound, passing eastward of Daggstenarna and the 3.3 m (11 ft.) patch northward. Vessels can anchor at will anywhere northward of Daggstenarna.

7D-9 HARNOSAND, with a population of about 18,000, is built on the northwestern side of Harnon, the adjacent mainland, and an islet between the two. Bridges connect the separate parts of the town. The principal exports are wood products; the principal imports are coal and coke. There is a custom house at Harnosand.

The port has about 3,900 feet of quayage. On the western side of Norra Hamnen: Djuphamnskajen is about 590 feet long with depths of 24 to 26 feet alongside. Kronholmskajen is about 890 feet long with depths of 8 to 14 feet alongside. The oil wharf is about 200 feet long with 34 feet alongside. On the eastern side of Norra Hamnen: Norra Skeppsbron is about 590 feet long with 14 to 16 feet alongside. Utsprangskajen is about 550 feet long with 26 feet alongside. Södra Skeppsbron is 1,000 feet long with 16 to 19 feet alongside. Railroad tracks, connecting with the general system, are laid on the quays on the western side of the harbor. There is a 15-ton crane on Kronholmskajen and a 6- and a 7-ton crane on Djuphamnskajen. A tug and several barges are available.

Provisions and ship's stores can be obtained. Water is supplied from hydrants on the quays or from a water boat. A stock of coal is maintained. There are machine shops in Harnosand and a drydock is located at Gustavsvik (sec. 7D-18) on Angermanalven, about 12 miles northward of Harnosand. Regular steamer communication is maintained with Stockholm and other Swedish and Baltic ports. Air transportation to Stockholm and Lulea is available. There is railroad communication with other parts of Sweden. A hospital is located in the southern part of the town.

ANGERMANALVEN

GENERAL REMARKS

7D-10 Angermanalven (Anger-manna Elf) enters the sea through Stora Inlopp, Lungo-

sundet, and the channel between the northern end of Hemson and the mainland northward. Large vessels can ascend the river as far as Nyland, a loading place about 20 miles from the entrance northward of Hemson. The shores are steep, with deep water close to them except in a few places. There are not many dangers in the fairway. The principal inlets entered from Angermanalven are Norafjärden, Lugnviksfjärden, and Strinnefjärden, on the eastern side, and Bollstafjärden (Yttre Lannas Fjärd), on the western side, southward of Nyland. Valshuvud (Hvalhufvud) is a bare and rounded hill on the peninsula northward of Hemson. It is visible from seaward at a considerable distance, but is not easily recognized as it has no distinguishing features. Lovviksberget, its summit, has an elevation of 787 feet. Roasen (Rodasen), a hill of the same height as Lovviksberget, is situated about 3 miles east-northeastward of Valshuvud. Its western side is steep, and its summit is covered with dark forest. The lower part of Angermanalven and the approach channels are in the Hemson defense area (sec. 7D-7).

CHANNELS

7D-11 Sannasundet (Sanna Sund), lying between the western side of Hemson and the mainland, leads northward from the western end of Lungosundet. From the northern end of Sannasundet, a channel leads between the southwestern side of Abordso, an island lying northwestward of Hemson, and the mainland. From the approach northward of Hemson, a channel leads west-northwestward between Abordso and the mainland northward, joining the southern channel off the northwestern point of Abordso.

Vessels proceeding from sea to Nyland pass over a least depth of 32 feet in the main river channel, westward of the islands of Sando and Svanon which lie about midway between Abordso and Nyland. Vessels proceeding eastward of Svanon pass over a least

depth of about 19 feet between Svanon and Sando.

PROHIBITED ANCHORAGES—OVERHEAD CABLE—BRIDGE

7D-12 Anchorage is prohibited in the vicinity of several submarine cables which cross Sannasundet, the channel westward of Abordso, and Angermanalven. LIGHTS indicate the location of some of these cables.

Anchorage is prohibited in the vicinity of pipe lines which cross the channels on either side of Sando, and the channel westward of Svanon. LIGHTS and BEACONS mark these pipe lines.

A pipeline extends from the shore at Utansjö, a loading place on the mainland westward of Abordso.

A bridge crosses the river on each side of Sando. The clearance of the western span is 131 feet at mean water level, and that of the eastern span is 39 feet.

An overhead power cable, with a clearance of 131 feet at mean water level, crosses the river channel westward of Svanon.

WATER LEVEL—CURRENT

7D-13 The water level varies between 1 1/2 and 2 1/2 feet above or below mean level. High water occurs in autumn, during freshets, and with southerly, southeasterly, and easterly winds. Low water occurs in early summer, and with northerly, northwesterly, and westerly winds.

The current in Angermanalven sets generally southward through the estuary and is

usually weak, but during spring freshets its strength increases, and at Nyland and in the narrow passages it sometimes attains considerable velocity.

NAVIGATIONAL AIDS

7D-14 A LIGHT is shown on the northeastern point of Valo, an islet lying westward of Hemson.

Sannasundet Light is exhibited about 2 3/4 miles north-northwestward of Stromskaten (sec. 7D-6).

A LIGHT is shown on Abordso about 1/2 mile southward of its northwestern end.

Hornon Light is shown about 1 mile north-northeastward of Abordso Light.

Veda Light is shown about 3/4 mile north-westward of Abordso Light.

A LIGHT is shown on the southwestern point of Hornoholmen, an islet lying about 1 1/2 miles north-northwestward of Abordso.

Other LIGHTS are shown between Hornoholmen and Nyland, and in Bollstafjarden.

FOG SIGNALS are sounded from two landings, on opposite sides of the river, for a ferry which crosses the channel northward of Abordso.

SPAR BUOYS, placed in accordance with the uniform system, mark dangers adjacent to the channels.

REGULATIONS

7D-15 Vessels must not exceed a speed of 7 knots in the vicinity of a ferry which



crosses Sannasundet, and in the channel westward of Sandö and Svanön, between the southern point of Sandö and the northern point of Svanön. A speed of 9 knots must not be exceeded by vessels within 550 yards of booming grounds in Ångermanälven, northeastward of Hornöholmen.

During the period when the Ångermanälven freezes over, temporary bridges are laid across ice-free channels in Sannasundet, between Åbordsö and the mainland and between Frånö and Kinnmärgen.

The ice-free channel between Åbordsö and the mainland is about 79 feet wide within a restricted area extending 1,640 feet upstream and downstream from the crossing position of the bridge. Both sides of the channel at either end of the restricted area are marked by clumps of twigs and by signboards, painted white and illuminated at night, which indicate permitted speed and channel width. A red light is shown on either side of the channel at the bridge crossing.

The ice-free channel between Frånö and Kinnmärgen, northward of Svanön, is about 79 feet wide within a restricted area extending 656 feet upstream and downstream from the crossing position of the bridge. Both sides of the channel within and at the end point of the restricted area are marked by posts painted red and surmounted by three-sided top marks. A post standing on either side of the channel at the bridge crossing displays signals regulating passage through the channel as follows: by day, a black ball hoisted on the western side of the channel means passage is closed; when lowered, passage is clear. At night, a red light on either side of the channel means the passage is closed; an additional white light under the red light on the western side of the channel means the passage is clear.

Vessels wishing to pass through the channels are cautioned to decrease speed and to give in sufficient time a sound signal consisting of a short, a long and a short blast.

A black board, on which is painted a white arrow pointing westward, is displayed on the southern point of Sandö when the ice in the sound eastward of that island will bear passenger traffic and no vessels may traverse the channel.

PILOTS

7D-16 See section 7D-7.

DIRECTIONS

7D-17 Vessels bound for Ångermanälven can pass through either Stora Inlopp or Lungösundet as directed in section 7D-8. From these entrance channels they should proceed through Sannasundet, passing eastward of Vålö, and westward of Åbordsö and a 4 1/4-fathom patch, marked by a spar buoy, lying about 400 yards westward of the light on Hornöholmen. Thence northward, vessels should pass westward of the islands of Granholmen, Sandö, and Svanön, and proceed north-northwestward to Nyland or northwestward into Bollstafjärden.

Vessels approaching the northern entrance of Ångermanälven can pass northward or southward of Storön. If entering southward of Storön, they should steer for Lövviksberget, seen about midway between the northeastern point of Hemsön and the southern point of Storön, bearing 326°. When the passage between the northeastern end of Hemsön and Hyndeskär, an islet lying about 1/4 mile northward, is open, vessels should steer through it in midchannel, thence, after passing Hyndeskär, they should steer for Hornon Light, bearing 301° ahead, through the fairway lying northward of Hemson and northeastward of Abordso, and proceed as previously directed.

Vessels using the passage northward of Storön should approach with the eastern entrance point of Grönviksfjärden (sec. 7D-7) in range with Lövviksberget 273°, or they can steer for Grönviksgrund (sec. 7D-6), bearing 257°. Passing between Storön and the mainland, they should then pass northward of Grönviksgrund and the group of

islets lying southwestward of it, and join the track which passes southward of Storön.

ANCHORAGES—LOADING PLACES—NAVAL DEPOT

7D-18 Anchorages adjacent to the northern entrance of Ångermanälven lie close westward of Lillholmen, an islet in the group westward of Storön, and in the southern part of Nordanövik, a bay on the northern side of Hemsön. At the Lillholmen anchorage the depths are $9\frac{1}{2}$ to $12\frac{1}{2}$ fathoms, mud, and in Nordanövik the depths are $9\frac{1}{2}$ to $11\frac{1}{2}$ fathoms, clay.

Utansjö (Utansiö) ($62^{\circ}46' N.$, $17^{\circ}56' E.$), on the mainland westward of Åbordsö, has one pulp quay 394 feet long, with depths of 24 to 26 feet alongside; one coal quay 230 feet long, with depths of 20 to 26 feet alongside; and a small quay with a depth of $9\frac{1}{2}$ feet alongside. The depth at the anchorage off the quays is $9\frac{1}{2}$ fathoms, mud. Vessels must anchor clear of the pipe line (sec. 7D-12) extending from shore. Vessels usually load at the quays. There is a 3-ton crane. Ice is usually an obstruction from the end of January to the middle of April.

Ramvik, on the western side of Ångermanälven and about 3 miles north-northwestward of Utansjö, has about 3,280 feet of quayage with depths of $6\frac{1}{2}$ to 36 feet alongside. There is anchorage in a depth of 8 fathoms, clay. Vessels usually load alongside the quays. Small quantities of provisions and fuel oil can be obtained. Water is supplied from hydrants.

Gustavsvik, where there is a naval depot, lies about 1 mile northward of Ramvik. There is anchorage in depths of $6\frac{1}{2}$ to 16 fathoms, clay. Two quays, one 230 feet long and the other 295 feet long, have a depth of 21 feet alongside. A drydock, entered between the quays, has the following dimensions: length on bottom, 541 feet; width at entrance

(bottom), 68 feet 11 inches; depth over blocks at mean water level, 26 feet. The depth outside the entrance is $24\frac{1}{2}$ feet. The drydock is equipped with a 3-ton traveling crane and 12-ton stationary crane. There is also a floating drydock with a lifting capacity of 300 tons. Machine shops are available.

Sprängsviken, about $1\frac{3}{4}$ miles northward of Gustavsvik, and the adjacent loading places of Nensjö and Skärtded have a common anchorage with a depth of $5\frac{1}{2}$ fathoms, clay mixed with sand. At Nensjö there is about 790 feet of quayage, with depths of 20 to 29 feet alongside. At Skärtded there is a wharf about 150 feet long, with a depth of $11\frac{1}{2}$ feet alongside, and a steamer landing with a depth of 13 feet alongside. Railroad tracks laid on the wharf connect with the general railroad system. There is a $2\frac{1}{2}$ -ton crane at Nensjö and a 3-ton crane at Skärtded. Provisions can be obtained. Water is piped to the quays. Ice usually closes these loading places to navigation during February and March.

Lunde, westward of the southern end of Sandö, has two wharves, about 130 and 425 feet long, with depths of $9\frac{1}{2}$ to 16 feet alongside. Provisions and water can be obtained. There is a machine shop and a marine railway for small vessels.

Svanö, on Svanön, has about 755 feet of quayage, of which 492 feet has a depth of 22 to 27 feet alongside. Vessels can anchor in depths of $5\frac{1}{2}$ to 6 fathoms, soft clay. There is a $2\frac{1}{2}$ -ton crane. A small tug is available. Provisions can be obtained. Minor repairs can be made. Ice usually closes this loading place to navigation during February and March.

Hallstanäs (Hallsta), on the western entrance point of Lugnviksfjärden, has one quay about 410 feet long, with a depth of 22 feet alongside; one quay about 345 feet

long, with a depth of 26 feet alongside. A 3½-ton and a 1½-ton crane are available. Cargo is worked alongside the quays. Vessels can anchor in a depth of 5 fathoms, mud. Small quantities of provisions can be obtained. Ice is usually an obstruction from the end of January to April.

Lugnvik, in Lugnviksfjärden, has a pulp quay with depths of 14 to 15 feet alongside. The anchorage in Lugnviksfjärden has depths of 8 to 13½ fathoms, clay. Vessels usually load from lighters. Provisions can be obtained. Ice is usually an obstruction from the end of January to April.

Frånö (Fråne), about ½ mile northwestward of Svanön, has about 1,150 feet of quayage with depths of 13 to 23 feet alongside. Vessels can anchor in depths of 4½ to 6½ fathoms, mud.

7D-19 Kramfors, about 2½ miles northwestward of Frånö, has about 2,800 feet of quayage with depths up to 26 feet alongside. There is anchorage in a depth of about 11 fathoms, clay, southward of Grusholmen, an islet lying close to the western shore of the river. Vessels loading timber lie at anchor with their sterns secured to dolphins and load from lighters. A 3-ton floating crane is used for discharging coal. A machine shop is available. Provisions and ship's stores can be obtained. Ice is usually an obstruction from the end of January to April.

Sandviken, about 1 mile northward of Kramfors, has about 1,100 feet of quayage with depths of 10½ to 27 feet alongside. The pulp quay, and the coal and sulphur quay, have depths alongside of 24 to 27 feet and 16 to 24 feet, respectively. Vessels usually work cargo at the quays. There are two cranes, one of 1½ tons and the other of 5 tons lifting capacity; the latter is fitted with a grab. Vessels can anchor in 8 to 13½ fathoms, clay. Provisions can be obtained. Minor repairs can be made. Ice is usually an

obstruction from the beginning of January to April.

Tugs are available.

Köja (Kioja), on the eastern side of the river and opposite Sandviken, has about 2,690 feet of quayage with depths of 3 to 19½ feet alongside. There is anchorage in 3½ to 7 fathoms, soft clay. When anchoring, vessels must avoid the vicinity of two submarine cables and a pipe line which are marked by range lights and beacons. Provisions can be obtained. Ice is usually an obstruction from the end of January to April.

Dynäs, on the southwestern side of Bollstafjärden, has a quay 574 feet long, with depths of 24 to 28 feet alongside. There is anchorage in 11 to 16 fathoms, clay. Provisions and water can be obtained. Ice is an obstruction from the beginning of January to April.

Väja, close west-northwestward of Dynäs, has a quay 984 feet long, with depths of 24 to 25 feet alongside and depths of 49 to 59 feet at a distance of 33 feet from it, and two quays, 295 and 361 feet long, with depths of 18 to 19 feet alongside. The depths alongside the two last-mentioned quays are liable to change because of accumulations of refuse from a pulp mill. There is anchorage in 11 to 16 fathoms, clay. Vessels loading lumber usually lie at anchor with their sterns secured to dolphins, loading from lighters. Provisions and water can be obtained.

Bollsta (Bolsta), near the head of Bollstafjärden, has a quay 394 feet long, with depths of 23 to 26 feet alongside except at its southern end where, for about 30 feet, the depths are less. There is also a wharf with depths of 10 to 12 feet alongside. Vessels loading lumber lie at anchor and secure their sterns to dolphins, loading from lighters. Vessels load wood pulp alongside the quay.

This loading place is usually closed to navigation by ice from the middle of December to the end of April.

Marieberg, on the eastern side of Ångermanälven and about $1\frac{1}{2}$ miles northwestward of Köja, has a quay 125 feet long, with a depth of 13 feet alongside. Vessels anchor and secure their sterns to dolphins, loading from lighters. Provisions can be obtained. Water is supplied by water boat.

Nyland ($63^{\circ}00' N.$, $17^{\circ}46' E.$), on the western side of the river and about $\frac{3}{4}$ mile northwestward of Marieberg, has about 1,165 feet of quayside with depths of 13 to $19\frac{1}{2}$ feet alongside. These depths are liable to change because of sand deposited by the river current. Ice usually closes this loading place to navigation from the beginning of January to the beginning of April.

COASTAL FEATURES—LANDMARKS (Continued)

7D-20 Gaviksfjärden (Gavik Fjärd), entered about $4\frac{1}{2}$ miles north-northeastward of Storön, is deep and well-sheltered. Its shores are mostly steep-to and there are few dangers. Several inlets in Gaviksfjärden afford **anchorage** to small vessels. Ringkallen (Ringkalleberg), a 696-foot hill on the eastern side of the fjord, is steep on its southern side, reddish, and has a wood on its summit.

Several islets and dangers lie in and outside the entrance to Gaviksfjärden. The outermost of the dangers are two patches, with depths of 4 and $1\frac{1}{4}$ fathoms, lying about $2\frac{3}{4}$ and $3\frac{3}{4}$ miles, respectively, north-eastward of Storön. The $1\frac{1}{4}$ -fathom patch is marked by a **spar buoy**. Several other islets and dangers lie within Gaviksfjärden. A $3\frac{1}{4}$ -fathom patch lies near the middle and a 5-foot patch in the western part of the fjord. The approach channel lies westward of the islets and dangers in the entrance. Pilots can

be obtained from Harnon (sec. 7E-4). Ice is usually an obstruction from January to March.

Barstahamn, about $6\frac{1}{2}$ miles northeastward of Storön, is a small harbor of refuge, in which there is **anchorage** in 6 to 10 fathoms, sand and clay. Barstaön, a rather high island with a tree-covered summit, lies in the harbor entrance. Three islets, the southernmost of which is Fågelskär (Fogelskär), extend southward from Barstaön. Norra Flasen, another islet, lies between Barstaön and the mainland northward. Älggrund, awash and marked on its western side by a **spar buoy**, lies close westward of Fågelskär.

Three channels lead into Barstahamn. The southern channel, available to vessels with a draft of $16\frac{1}{2}$ feet, is westward of the islets off the entrance of the harbor. The other two channels lie southward and northward of Norra Flasen and are available to vessels with drafts of $16\frac{1}{2}$ and $9\frac{3}{4}$ feet, respectively.

Pilots can be obtained from Harnon. The harbor is usually free of ice, but in a severe winter it may freeze over during February and March.

Directions.—Vessels entering Barstahamn through the southern channel can pass on either side of Älggrund. The western point of Barstaön in range about 012° with Älgsjöberget (sec. 7E-7) leads eastward of that danger; the point on the mainland westward of Barstaön in range 023° with the northwestern point of Barstaön leads westward of it. Having passed Älggrund, vessels should keep in midchannel until the northern side of Norra Flasen opens northward of Barstaön, then anchor as convenient.

Vessels entering through the channel between Barstaön and Norra Flasen should steer for the eastern end of Barstaön bearing 313° , passing about $\frac{1}{2}$ mile southwestward of some rocks above water lying about 1 mile eastward of Barstaön. The eastern end of Barstaön should be passed at a distance

of about 200 yards to avoid a $4\frac{3}{4}$ -fathom patch lying about $\frac{1}{4}$ mile east-southeastward of Norra Flasen, thence, keeping in mid-channel between Barstaön and Norra Flasen, vessels may proceed to the anchorage.

ANCHORAGES

7D-21 Ävikebukten.—See section 7D-5.

Byviken.—See section 7D-5.

Utanöfjärden.—See section 7D-6.

Härnösand.—See section 7D-8.

Lillholmen.—See section 7D-18.

Nordanövikén.—See section 7D-18.

Gaviksfjärden.—See section 7D-20.

Barstahamn.—See section 7D-20.

Anchorage at the loading place in Älandsfjärden and Ångermanälven are described with the related features.

Part E. HÖGBONDEN TO JÄRNÄSUDE

7E-1 Högbonden ($62^{\circ}52' N.$, $18^{\circ}29' E.$) is a high and partly wooded island lying about $\frac{2}{3}$ mile off the mainland. Because of its steep and broken sides it is easily distinguished, especially from northward or southward. A $1\frac{1}{2}$ -fathom patch lies about $\frac{1}{4}$ mile southward of the southern point of the island, and a $2\frac{1}{2}$ -fathom patch, marked by a spar buoy, lies about $\frac{1}{3}$ mile southeastward of the same point. A rock above water lies about $\frac{1}{2}$ mile westward of Högbonden.

CABLE.—A submarine cable is laid from Hogbonden west-northwestward to the coast. Anchoring is prohibited within 200 yards of this cable.

Högbonden Light is shown near the summit of the island.

Algsjö Light is shown about $1\frac{1}{2}$ miles north-northwestward of Hogbonden Light.

Höglosmen, an island close northward of Högbonden, is also partly wooded, but is lower than Högbonden. Furan, an islet close westward of the northern end of Höglosmen, has foul ground extending from its eastern side. A spar buoy marks a 2-fathom patch which lies close southward of Furan. The

channel between Höglosmen and Furan has a least depth of 5 fathoms and that on the western side of Furan has a depth of nearly 30 fathoms.

COAST—GENERAL

7E-2 Between Högbonden and Skagsudde, a point lying about 24 miles northeastward, the coast is much indented and is fronted by a number of islands. The coast and islands are generally high and wooded, several of the higher hills being visible from a considerable distance seaward. All dangers off this part of the coast lie within $2\frac{1}{4}$ miles of the shores of the mainland or the outer islands.

Between Skagsudde and Järnäsudde, about 23 miles northeastward, two extensive fjords and several smaller inlets indent the coast. The land near the coast is mostly wooded and moderately high. Numerous islets and dangers lie off the coast and in the coastal indentations. The outermost off-lying danger lies about $10\frac{1}{2}$ miles southward of Järnäsudde.

The principal port between Högbonden and Järnäsudde is Örnköldsvik, lying at the head of Örnköldviksfjärden, about 10 miles northwestward of Skagsudde. There are numerous loading places in the various inlets.

DEPTHS—OFF-LYING ISLANDS AND DANGERS

7E-3 The charted depths off this coast are very irregular. Between Högbonden and Skagsudde, there is deep water close to the shores of the mainland and the off-lying islands. Between Skagsudde and Järnäsudde, parts of the coast and some of the islands are bordered by shoal banks which, in most places, do not extend far from shore.

Skötbådan, a 4-fathom patch marked on its northern side by a spar buoy, lies about $2\frac{1}{4}$ miles northeastward of the northern point of Höglosmen.

Gnäggen, a small islet, lies about 6 miles northeastward of Högbonden Light and nearly 2 miles offshore. A fishing light is shown from Gnäggen Rock. Storgrund, awash at its southwestern end, which is marked by a spar buoy, lies $2/3$ to $1/4$ miles southwestward of Gnäggen. A $6\frac{1}{2}$ -fathom patch lies about 1 mile eastward of Gnäggen.

NORRA AND SÖDRA ULVÖN

7E-4 Norra and Södra Ulvön (North and South Ulfö) are two large, high, and wooded islands separated from each other by a narrow channel. The southern end of Södra Ulvön lies about $1\frac{1}{2}$ miles northward of Gnäggen. Near the northern end of Norra Ulvön, the higher of the two islands, is Norra Ulvö Kasberg, a flat-topped 459-foot hill.

Submarine cables extend from the western side of Södra Ulvön to the mainland west-southwestward. White notice boards mark the landing places of the cables, and their direction is indicated by range beacons. Anchoring is prohibited within 550 feet of the cables.

Storgrunden, lying about $1\frac{1}{4}$ miles eastward of the southern end of Södra Ulvön, has a least depth of $3\frac{1}{2}$ fathoms near its northern end. A spar buoy is moored about $1/4$ mile southeastward of the shoalest patch.

Flasan Light is shown on Flasan, a small islet lying about $3/4$ mile east-southeastward of the northeastern extremity of Södra Ulvön. Several islets lie northward and north-northeastward of Flasan.

Lönnbådan, a $3\frac{1}{4}$ -fathom shoal, lies about $3/4$ mile northward of Flasan and is marked by a spar buoy, and a 5-foot patch lies close southward of this shoal. A 4-foot patch marked by a spar buoy lies about $2\frac{1}{2}$ miles north-northeastward of Flasan.

Värnsingarna, two narrow islands, lie eastward of the northern end of Norra Ulvön. A group of small islets lies about $1/2$ mile east-northeastward of the western island of Värnsingarna.

Ulvösundet (Ulfö Sound), separating Norra and Södra Ulvön, is entered at its northeastern end through narrow channels lying on either side of Åskäret, an islet fronting the entrance. Because of the sharp turn required when rounding the northeastern point of Södra Ulvön, only small vessels should use the southern approach. Two range lights on Norra Ulvön lead through the channel westward of Åskäret. The northern channel is available to vessels of $19\frac{1}{2}$ -foot draft. The southwestern entrance channel has a least depth of 15 feet and is encumbered by a reef on its northern side. During severe gales a strong current sets into the sound through this entrance. Three lights are occasionally shown in the western part of Ulvösundet. Two submarine cables cross Ulvösundet; anchorage is prohibited in their vicinity.

The water level in Ulvösundet varies from about $1\frac{1}{2}$ feet below to $2\frac{1}{4}$ feet above mean sea level. There is a water level gauge close within the southwestern entrance.

Ice usually closes the sound to navigation from the middle of January to the middle of April.

PILOTS.—Pilots for Ullangerfjärden can be obtained from Harno or Harnosand, or Skagsudde, or Ornskoldsuik. For general information regarding pilotage in Swedish waters, see section 1-25.

Directions.—Vessels bound for Ulvösundet and intending to enter through the channel westward of Åskäret should steer for Flasan Light bearing 003° , if approaching westward of Storgrunden, or 315° , if approaching eastward of it. On either of these tracks, when

within about $\frac{1}{2}$ mile of Flasan Light, vessels should alter course westward and steer into the channel between Åskäret and Södra Ulvön. Great care must be exercised in entering the sound, the channel being less than 200 yards wide and a turn of about 90° required.

Vessels intending to use the channel north-westward of Åskäret should approach with the southeastern point of Norra Ulvön in range 239° with the point on the southern side of Norra Ulvön. On this course vessels pass very close to a $2\frac{1}{2}$ -fathom patch near the southeastern side of Kvarngrunnan (Quarngunnal), an islet lying about $1\frac{1}{2}$ miles north-northeastward of Flasan, and close northwestward of the spar buoy moored northward of Lönbadan. When northeastward of the northern point of Åskäret, vessels should keep in midchannel and proceed into the sound.

Vessels are not to exceed a speed of 7 knots in Ulvösundet.

Ulvöhamn, ($63^\circ 01' N.$, $18^\circ 39' E.$) a loading place in Ulvösundet, affords good anchorage in depths of $9\frac{1}{2}$ to $13\frac{1}{2}$ fathoms, clay. There is a pier about 140 feet long, with depths alongside of 13 feet on the northern side and $9\frac{3}{4}$ feet on the southern side. Provisions, water, and fuel oil can be obtained. There is telephone communication with the mainland. Pilots can be obtained from Skagsudde or Ornsköldsvik.

OFFLYING ISLANDS AND DANGERS (Continued)

7E-5 Skrubban, an island lying about 3 miles northeastward of the northern end of Norra Ulvön, is the southwesternmost of a chain of islands and islets extending northeastward to the entrance of Örnsköldsviksfjärden (sec. 7E-9).

Storgrund, its shoalest part lying about $2\frac{1}{2}$ miles east-northeastward of Skagsudde (sec. 7E-12), has a least depth of $2\frac{1}{4}$ fathoms and is marked on its eastern side by a spar buoy.

Snälgrund, a 4-foot patch marked on its western side by a spar buoy, lies about $3\frac{1}{2}$ miles northeastward of Skagsudde. Two

patches, with depths of $4\frac{3}{4}$ and $3\frac{3}{4}$ fathoms, lie between Storgrund and Snälgrund.

Nygrund, its shoalest part lying about $4\frac{1}{4}$ miles northeastward of Skagsudde, has a least depth of 5 feet and is marked on its northeastern and northwestern sides by spar buoys. A $3\frac{3}{4}$ -fathom patch lies between Snälgrund and Nygrund.

Själbådan (Skälådan), a small islet, lies about $6\frac{1}{4}$ miles northeastward of Skagsudde. Själbådan Beacon, equipped with a radar reflector, stands on this islet. A $1\frac{1}{2}$ -fathom patch lies close east-northeastward of the beacon.

Finngrund, awash, lies about $\frac{3}{4}$ mile east-northeastward of Själbådan Beacon and is marked on its northeastern side by a spar buoy with a radar reflector. A $5\frac{1}{2}$ -fathom patch lies about $\frac{1}{2}$ mile farther east-northeastward.

Vallinsgrund, a 2-fathom steep-to rocky patch, lies about 5 miles eastward of Stjärnödde, a point about $10\frac{1}{4}$ miles northeastward of Skagsudde. A spar buoy with a radar reflector marks the southern side of this danger. A $4\frac{3}{4}$ -fathom patch lies about $\frac{3}{4}$ mile north-northwestward of Vallinsgrund.

Långrogrunden, lying 12 to 14 miles eastward and east-northeastward of Själbådan Beacon, comprises two banks separated from each other by a deep channel about 1 mile wide. At the northeastern end of Norra Långrogrunden are two rocks awash, from which a light is shown and a whistle is sounded. Several rocky ledges and boulders, with depths of 5 feet to $4\frac{3}{4}$ fathoms, lie between the rocks awash and the southwestern extremity of the bank. Södra Långrogrunden has several rocky patches with depths of $2\frac{3}{4}$ to 6 fathoms. Its southwestern end is marked by a spar buoy equipped with a radar reflector. From August 1st until the close of navigation, Södra Långrogrundet lighted whistle buoy, with a radar reflector, is moored close south-

ward of the spar buoy. Several patches, with depths of $6\frac{1}{2}$ to 7 fathoms, lie within 5 miles westward of the southeastern end of Södra Långrogrunden. Depths of 9 to 12 fathoms are reported to lie about $9\frac{1}{4}$ miles southeastward of Södra Långrogrunden.

Islands and dangers near the coast, adjoining navigable channels, and in the approaches to inlets are described with the related features.

NAVIGATION

7E-6 From a position on the coastal track about $2\frac{1}{2}$ miles southeastward of Högbon den Light, vessels may steer a course of 039° for about 25 miles to a position about $3\frac{1}{2}$ miles east-southeastward of Skagsudde, thence a course of 072° for about $31\frac{1}{4}$ miles to a position about $1\frac{1}{2}$ miles southeastward of Sydostbrotten Light (sec. 9A-3). This track makes its closest coastal approach off Högbon den, clears all off-lying dangers, and leads over a least charted depth of 18 fathoms.

Vessels bound for Nordmalingsfjärden, Järnåshamn, and Örefjärden may, from a position about $3\frac{1}{2}$ miles east-southeastward of Skagsudde, steer a course of 046° for about 20 miles to a position about $2\frac{1}{4}$ miles southward of Järnåsudde, the closest coastal approach. This track passes nearly 1 mile southeastward of Vallingsgrund and leads over charted depths of more than 10 fathoms.

COASTAL FEATURES—LANDMARKS

7E-7 Edsätterfjärden, entered north-northwestward of Höglosmen, has steep-to shores on both sides. Älgsjöberget (Elgsjöberg), a 643-foot, flat-topped hill, rises on the southern side of the fjord. The only danger in the fairway is a $5\frac{1}{4}$ -fathom shoal lying about 1 mile within the entrance. There is anchorage in 11 to 16 fathoms, sand and clay, in the inlets on the northern side of the fjords. Pilots can be obtained from Harnon.

Omnefjärden, entered about $2\frac{1}{2}$ miles north-northeastward of Edsätterfjärden, has several inlets in which vessels can anchor. Two small islets lie in the entrance and a rock above water lies near the southern side of the entrance. A group of islets lies near the middle of the fjord about 1 mile within the entrance. Deep channels lie on both sides of the islets in the entrance and the inner group. Pilots can be obtained from Harnon.

Ytternäsan Light is shown on the northern entrance point of Omnefjärden.

Omne, a loading place in an inlet entered from the head of Omnefjärden, has an anchorage with depths of $5\frac{1}{2}$ to 6 fathoms, clay. Anchoring is prohibited in the vicinity of two submarine cables which cross the inlet northward of Omne. There are wharves with a depth of 11 feet alongside. Minor repairs can be made.

Måviken, a loading place on the northern side of Omnefjärden, has an anchorage with depths of $7\frac{1}{2}$ to $9\frac{3}{4}$ fathoms, clay. There are quays with a depth of 10 feet alongside and a pier with greater depths.

Ullångerfjärden, entered westward of Norra and Södra Ulvön, is deep and clear of dangers. Norrfjärden and Dockstafjärden (Sör Fjärd) indent the northern side of Ullångerfjärden. Mjällomberget (Miöllomsberg), about 1 mile southward of the southern shore of Ullångerfjärden, is 922 feet high; an aero light is shown from the highest point. Valaberget (Hvalaberg) and Värnsberget, situated on the peninsula between Norrfjärden and Dockstafjärden, are 495 and 866 feet high. Skuleberget, about 1 mile northward of the head of Dockstafjärden, is 961 feet high, has a flat top and steep sides, and is visible at a distance of 20 or 25 miles. Mjältön (Miältö), an island lying near the coast immediately northward of the entrance of Ullångerfjärden, has a greatest height of 771 feet.

There are several loading places, accessible to deep-draft vessels, in Ullangerfjärden. From southward the fjord can be approached through the passage between Södra Ulvön and the mainland. From northward it can be approached through the sound between Mjältön and the mainland or through channels, separated by several islets, between Mjältön and Norra Ulvön. Ice usually obstructs navigation from January to April. Pilots can be obtained from Harnon or Harnosand, Ornsköldsvik, or Skagsudde.

Salsåker (Saltåker), a loading place on the southern side of Ullangerfjärden, has an anchorage with a depth of about 6 fathoms, clay and mud. There is a wharf about 160 feet long, with a depth of 11 feet alongside.

Åskja (Åskia), a loading place at the head of Ullangerfjärden, has an anchorage with depths of $4\frac{3}{4}$ fathoms, clay. Vessels with a draft not exceeding $19\frac{1}{2}$ feet can secure their sterns to dolphins. There is a small quay with a depth of $14\frac{1}{2}$ feet alongside.

Docksta, a loading place at the head of Dockstafjärden, has an anchorage with a depth of about 8 fathoms, clay. Vessels with a draft not exceeding $14\frac{1}{2}$ feet can secure their sterns to dolphins. There is a wharf with a depth of 11 feet alongside.

7E-8 Between Ullangerfjärden and Skagsudde, about 18 miles northeastward, the coast is indented by several fjords and is fronted by a number of islands and islets in addition to those previously described. Fåleberget, about $8\frac{1}{2}$ miles northward of Norra Ulvön, is a steep, 764-foot hill. Åsberget, the westernmost of three hills about 5 miles northward of Fåleberget, is 712 feet high. Hornöberget, about 7 miles northwestward of Skagsudde, is 430 feet high and flat-topped. It slopes steeply on its eastern side to a lower plateau, and is conspicuous to vessels approaching Örnsköldsvik.

Rone Flase Light ($63^{\circ}04' N.$, $18^{\circ}39' E.$) is shown on an islet in the passage between Norra Ulvön and Ronön (Ronö), an island lying about $\frac{1}{2}$ mile westward.

Näske is a loading place at the head of Näskefjärden which is entered about 3 miles northwestward of Rone Flase Light. The anchorage has a depth of about 6 fathoms, clay, and can be approached by vessels of any draft.

Köpmanholmen, a loading place in Nätrafjärden, northeastward of Näskefjärden, has an anchorage with a depth of about 16 fathoms, clay. The approach through the fjord is deep and clear of dangers, but the anchorage is exposed to southeasterly winds. There is about 980 feet of quayage with depths of $12\frac{1}{2}$ to 34 feet. Vessels up to 650 feet in length with a draft of 31 feet can be accommodated. Provisions and water can be obtained. Fuel oil and diesel oil are supplied by tank truck. Minor repairs can be effected. A doctor is in the port. Pilots are obtained from Harnon or Harnosand, Ornsköldsvik, or Skagsudde. Ice usually obstructs navigation from the middle of January to the middle of April.

Trysunda Light is shown on Trysunda, an island located about 6 miles southeastward of Köpmanholmen.

Inner passage.—Vessels from southward can proceed to Örnsköldsvik or the loading places southward of it by using an inner passage which leads westward of Högbonden and Furan, between Södra and Ulvön and the mainland, between Norra Ulvön and Rone Flase Light, and inside the chain of islands extending from Skrubban to the entrance of Örnsköldsviksfjärden. The depths in this passage are sufficient for vessels of any draft. Vessels of suitable draft can continue by the inner passage around Skagsudde, passing southward of Råskärsön (Råskär), an island lying off the entrance of Örnsköldsviksfjärden, and thence as described in section 7E-12.

ÖRNSKÖLDSVIKSFJÄRDEN

7E-9 Örnsköldsviksfjärden is entered between Skommarskatan, a point on the mainland lying about $10\frac{1}{2}$ miles northeastward of Rone Flase Light, and the southwestern point of Malmön, an island separated from



the eastern side of the fjord by a narrow channel. There are depths of over 10 m (5 1/2 fms.) in the fairway to Ornskoldsvik at the head of the fjord and to loading places on its shores. Vessels can approach the entrance on either side of Raskarson. The channel eastward of Malmön is navigable only by small craft. Three islands lie on the northern side of the principal fairway through the fjord.

Caution.—A defensive area is located, westward of Malmön and southward of Burön, in the approaches to Ornskoldsvik. Surface navigation is permitted through the area but anchorage and fishing are prohibited due to the possible presence of bottom mines. Passage through the area during thunderstorms may be dangerous.

Navigation.—Vessels bound for Örnköldsviksfjärden from southward, and having arrived at a position on the coastal track 4 1/2 miles southward of Ytternäsan Light, should steer a course of 021° for about 6 3/4 miles to a position about 2 miles eastward of Flasan, where pilots can be obtained. This track passes about 3/4 mile east-southeastward of the buoy marking Storgunden and leads over depths of more than 37 m (20 fms.).

The water level in Ornskoldsviksfjärden is lowered about 0.4 m (1 1/2 ft.) by strong northerly winds and is raised the same amount by strong southeasterly winds.

Ice usually obstructs navigation from January to March.

Navigational aids.—Råskärön Light is shown on the northeastern point of Råskärön.

Two pairs of range lights are located in Grisslan fishing harbor in a position about 1 mile south-southwestward of Råskärön Light. These fishing lights are shown only when needed.

Skommarskatan Light is shown on the western entrance point of Örnköldsviksfjärden.

Bonässund Light is shown on the southwestern shore of Örnköldsviksfjärden about 2 3/4 miles from its head.

Spar buoys, placed in accordance with the general system, mark dangers adjacent to the channels.

Submarine cables are laid from Råskärön to Skommarskatan, across Örnköldsviksfjärden about 1 1/3 miles from its head, and from two of the islands in the fjord to the mainland. Anchoring is prohibited in the vicinity of these cables.

Pilots for inward bound vessels can be obtained from Harnön and Skagsudde. Departing vessels can obtain pilots from Ornskoldsvik, where a watch is kept between 0900 and 1700 on weekdays only. For general information regarding pilotage in Swedish waters, see section 1-25.

Directions.—From a position about 2 miles eastward of Flasan Light if approaching from southward, or a position about 3 1/2 miles east-southeastward of Skagsudde if approaching from northward, vessels bound into Örnköldsviksfjärden from seaward should proceed to a position about 2 miles southeastward of Råskärön Light. From this position they should steer for Hornöberget seen midway between the southwestern point of Malmön and Råskärön, bearing 333°. This course leads about 1/4 mile northeastward of some rocks above water lying about 3/4 mile southward of Råskärön Light. Passing close northeastward of Råskärön, vessels should then steer between the western side of Malmön and the mainland. When eastward of Hörnskatan, a salient point about 1 3/4 miles north-northeastward of Skommarskatan Light, they should alter course westward and keep from 200 to 400 yards off the southern shore of the fjord to clear two shoals which lie on the northern side of the channel, and are marked on their southern sides by spar buoys. Vessels should

pass about 300 yards southward of a shoal, on which are some rocks above water, lying about $\frac{1}{4}$ mile east-northeastward of Bonäs-sund Light, and marked on its southern side by two spar buoys; thence proceed in mid-channel into the northwestern part of the fjord, passing southwestward of a spar buoy moored nearly 1 mile north-northwestward of Bonässund Light.

Anchorage—Loading places.—Vessels can anchor in depths of $6\frac{1}{2}$ to 10 fathoms, clay, about 600 yards off the southeastern side of Burön, an island lying about 1 mile north-eastward of Malmö.

Domsjö, a loading place on the southwestern side of Örnköldsviksfjärden about $1\frac{1}{2}$ miles from its head, has an anchorage with a depth of about 11 fathoms, clay. Dolphins for stern moorings are available. There are quays at Domsjö and Alfredshem, located close westward, with depths of 4 to 27 feet along-side. There is a 6-ton crane on the south pier at Alfredshem.

Hörneborg, a loading place about $\frac{3}{4}$ mile north-northwestward of Domsjö, has a pier 213 feet long, with depths of 16 to 36 feet alongside. There is also an oil pier with a depth of 34 feet about $6\frac{1}{2}$ feet off the pier-head and at the dolphins.

At Järved, almost 1 mile northward of Domsjö, there is an oil pier about 330 feet in length with a depth of 35 feet alongside. Two mooring buoys are located off the pier. A pipeline extends from the shore about 1 mile northwestward from the pier.

Alne and Bodum are other loading places in Örnköldsviksfjärden.

ÖRNKÖLDSVIK

Position: 63°17' N., 18°43' E.
Depths: Approach, over $5\frac{1}{2}$ fathoms.
 Harbor, 7 to 15 fathoms.
 Berths, 13 to $26\frac{1}{4}$ feet ($6\frac{1}{2}$ feet from quay).
Tidal rise: Negligible.

7E-10 Örnköldsvik has a good harbor which is accessible to vessels of the deepest draft.

Navigation.—See section 7E-9.

Ice usually closes the harbor to navigation during February and March.

Depths.—The approach channel to the harbor has depths of over $5\frac{1}{2}$ fathoms. The general depths in the harbor are 7 to 15 fathoms. The depths at the berths are described in section 7E-11.

Harbor.—The harbor is enclosed within the shores bounding the head of Örnköldsviksfjärden. It affords anchorage to vessels of any draft; the bottom is mud and clay. The inner part of the harbor is bordered by quays. A light is shown on a pier at the head of the harbor. A line throwing apparatus is located at Örnköldsvik.

Pilots.—See section 7E-9.

Directions.—See section 7E-9.

7E-11 Örnköldsvik, at the northern end of the harbor, is a town with a population of about 9,000. The principal exports are lumber, wood pulp, and other wood products. Coal and salt are imported. A custom house in the town serves the Örnköldsvik Customs District.

There is over 2,700 feet of quayage at Örnköldsvik. Sliperikajen, the southernmost quay on the eastern side of the inner part of the harbor, is about 410 feet long, with a depth of $21\frac{1}{4}$ feet at a distance of $6\frac{1}{2}$ feet from the quay. Stenkajen and Tullkajen, northwestward of Sliperikajen, have a combined length of about 1,280 feet; Stenkajen has a depth of $26\frac{1}{4}$ feet and Tullkajen has a depth of $16\frac{1}{2}$ feet, both depths being at a distance of $6\frac{1}{2}$ feet from the quay. Strandkajen, at the head of the harbor, is about 720 feet long, with depths of 13 to 21 feet at a distance of $6\frac{1}{2}$ feet from the quay. A coal quay, on the western side of the harbor, is about 340 feet long, with a depth of 23 feet at a distance of $6\frac{1}{2}$ feet from the quay. Railroad tracks, connecting with the general system, are laid on most of the quays. A $6\frac{1}{2}$ -ton crane and a 15-ton crane are located on Stenkajen. Tugs are available.

Provisions, coal, and fuel oil can be obtained. Water is piped to the quays and can also be supplied by water boat. There is a machine shop and a marine railway for small vessels at Bonässund, about $2\frac{1}{2}$ miles southeastward of Örnköldsvik. A floating drydock, capable of holding a 350-ton vessel, is also located here. Regular steamer communication is maintained with Stockholm and other Swedish ports. Örnköldsvik is connected to the general railroad system. A hospital is available.

COASTAL FEATURES—LANDMARKS (Continued)

7E-12 Skagsudde, a point covered with dark trees, is the southern extremity of a peninsula on the eastern side of the approach to Örnköldsvik. Skag Beacon stands about 1 mile north-northwestward of the point.

Skagsudde Light ($63^{\circ}11' N.$, $19^{\circ}01' E.$) is shown on the southern end of Skagsudde. A fog signal is sounded. A radiobeacon transmits close north-northwestward of the light.

A beacon marks the southwestern extremity of Skagsudde, and a fishing light is shown occasionally in a small inlet on the southwestern side of Skagsudde.

Several dangers lie southward and south-southeastward of Skagsudde. Skälbådarna, the westernmost danger, has parts above water, and is marked on its northern side by a spar buoy. A light is shown from a white radar reflector on a tower on Skälbådarna. Finngrund, close eastward of Skälbådarna, has a least depth of 1 fathom, and is marked on its northern side by a spar buoy. A $5\frac{1}{2}$ -fathom patch lies about $1\frac{3}{4}$ miles east-southeastward of Skagsudde.

Between Skagsudde and Stjärnöudde the coast is wooded and becomes higher in the vicinity of the latter point. Numerous islets, rocks, and shoals front this coast and encumber the approaches to several inlets which indent it. Södra and Norra Mosjöberget (Södra and Norra Mosjöberget) are two conspicuous hills lying northwestward and south-eastward of each other, about 6 miles westward of Stjärnöudde. Södra Mosjöberget, 318 feet high, has a rounded, bare, and yellowish summit. Norra Mosjöberget, 476 feet high, is covered with trees; its highest part is flat-topped and its southern side falls abruptly for a short distance, then slopes more gradually.

Inner passage.—Vessels from southward, bound for loading places between Skagsudde and Stjärnöudde, can use a continuation of the inner passage described in section 7E-8. Vessels with a draft not exceeding 13 feet can pass northward of Skälbådarna and Finngrund, thence westward of Storgrund, where vessels of 23-foot draft can enter the inner passage. The channel trends north-northeastward, passing westward of Klinten, Snålgrund, and Nygrund, thence between Flatbotten, a $5\frac{1}{4}$ -fathom patch lying about 2 miles west-southwestward of Själbådan Beacon, and a 5-fathom patch westward of Flatbotten.

Vessels with a draft not exceeding $19\frac{1}{2}$ feet can continue northward, passing close westward of Antgrund, awash, which lies about $1\frac{1}{2}$ miles west-northwestward of Själbådan Beacon and is marked by a spar buoy, thence westward of Äggskär and Granön, the southwestern and northwestern islets of a group lying about midway between Själbådan Beacon and Husum Light. Leading between some shoals, marked by spar buoys, lying northward of Granön, the inner passage ends in the approach to Husum.

Vessels with a draft greater than $19\frac{1}{2}$ feet must, after passing Flatbotten, proceed northeastward, passing between Själbådan and the islets and dangers lying northward and northwestward of it.

Skags Fläsor Light stands on the northeast end of the easternmost island of Fläsorna in a position about $2\frac{1}{4}$ miles east-northeastward of Skagsudde Light.

7E-13 Skagshamn is a small harbor entered between Gråklubban, a small islet lying close to shore, nearly 1 mile northeastward of Skagsudde, and Stora Harskär, an islet lying about $\frac{1}{2}$ mile north-northeastward. It is accessible to vessels with a draft of $19\frac{1}{2}$ feet, and affords anchorage in depths of 16 fathoms, clay, in the outer part of the harbor and 4 fathoms, clay, in the inner part. A small pier has a depth of $10\frac{1}{2}$ feet along-side. An overhead cable with a clearance of about 65 feet extends from Gråklubban to the mainland westward. Ällövik Light is shown on the western shore of an inlet on the northern side of Skagshamn. The water level in the harbor varies from about 3 feet below sea level to about 3 feet above it. Ice obstructs navigation from February to April.

PILOTS.—Skagsudde pilot look-out station is at Skagsudde, where inward bound vessels should obtain pilots. Pilots meet vessels off the outermost shoals southward of Skagsudde. For general information regarding pilotage in Swedish waters, see section 1-25.

Directions.—Vessels approaching Skagshamn from southward should steer for Ällövik Light on a bearing of about 330° , passing northeastward of Alfgrund, a $3\frac{1}{4}$ -fathom

patch lying about $\frac{1}{2}$ mile southeastward of Gråklubban and marked on its eastern side by a spar buoy; thence westward of a rock above water, lying about $\frac{1}{3}$ mile east-northeastward of Gråklubban. Continuing on the same course, vessels should pass between Finnklippan, an islet lying about $\frac{1}{2}$ mile northward of Gråklubban, and Lilla Harskär, an islet close northwestward of Stora Harskär. Passing southwestward of a 2-fathom patch marked on its southern side by a spar buoy, and northeastward of a spar buoy marking shoal water fringing the mainland about 300 yards northward of Finnklippan, vessels may then anchor in the outer part of the harbor, or, altering course westward, may proceed to the anchorage in the inner part.

Bergöfjärden, an inlet entered about $2\frac{1}{2}$ miles north-northeastward of Gråklubban, is much encumbered with islets and shoals. A narrow channel with a least depth of $14\frac{1}{2}$ feet leads westward along the southern shore of Bergöfjärden, thence northward into Risöfjärden, the inner part of the inlet. A fishing light is shown on the northern entrance point of Bergöfjärden. Pilots can be obtained from Skagsudde. Ice is usually an obstruction from the middle of November to May.

Skede, a loading place on the western side of Risöfjärden, has a quay about 320 feet long, with a depth of 13 feet at a distance of $6\frac{1}{2}$ feet from it. An anchorage off Skede has a depth of about $5\frac{1}{2}$ fathoms, mud.

HUSUM

7E-14 Husum ($68^{\circ}20' N.$, $19^{\circ}10' E.$), a loading place about $2\frac{1}{2}$ miles westward of

Stjärnödde, lies at the northern end of a harbor entered between Åskär, an islet lying about $3\frac{1}{2}$ miles northward of Själbådan Beacon (sec. 7E-5), and the mainland westward. A narrow channel separates Åskär from the southern end of a peninsula which forms the eastern side of the harbor. Åskär Beacon, stands on the islet of the same name. Ramö, an islet, lies near the middle of the harbor. A conspicuous chimney, 243 feet high, stands on the eastern side of the harbor, about $\frac{3}{4}$ mile northward of Åskär Beacon.

Husum Light is shown on Aggö, a point lying nearly 1 mile west-southwestward of Åskär Beacon. Two range lights are shown at the northern end of the harbor.

Several dangers lie in the approach to Husum. A $4\frac{3}{4}$ -fathom patch and a 3-fathom patch, the latter marked on its northeastern side by a spar buoy with a radar reflector lie about $1\frac{1}{4}$ and $1\frac{1}{2}$ miles southeastward of Åskär Beacon. Tritongrund, an 11-foot patch marked by a spar buoy on its southwestern side, and Åskärgrund, awash, marked by a spar buoy on its western side, lie about $\frac{1}{4}$ mile south-southwestward and west-southwestward of Åskär Beacon.

Vessels with a draft of $32\frac{1}{2}$ feet can approach from seaward and proceed to an anchorage in which is a depth of about $9\frac{1}{2}$ fathoms, sand and clay, between Ramö and the eastern side of the harbor. Vessels at anchor lie with their sterns moored to the shore. Current from the mouths of two small rivers flowing into the

head of the harbor is somewhat troublesome when mooring, especially in the spring.

Ice closes the harbor to navigation from the beginning of February to the end of March.

Pilots can be obtained from Skagsudde or Bredskar (sec. 9A-20).

Directions.—Approaching from seaward, vessels should steer for Husum Light in range 279° with Södra Mosjöberget, this course leading about 300 yards northward of the $4\frac{3}{4}$ -fathom patch lying southeastward of Åskär. When about 800 yards eastward of Husum Light, course should be altered northward and the range lights at the northern end of the harbor brought in range 007° . This range leads to the anchorage, passing westward of the spar buoys marking Tritongrund and Åskärgrund.

Facilities.—A newly constructed concrete quay 1,148 feet long has a depth of 32 feet alongside. Other quays totaling 443 feet in length have depths of $6\frac{1}{2}$ to $15\frac{1}{4}$ feet alongside. One 5-ton crane is located on these latter groups. A tug is available. Ship's stores, provisions, and water can be obtained. Regular steamer communication is maintained with Stockholm and other Swedish ports.

COASTAL FEATURES—LANDMARKS (Continued)

7E-15 Fanbyviken, entered about $1\frac{1}{2}$ miles northeastward of Åskär Beacon, is a narrow inlet in which there is anchorage in depths of $6\frac{1}{2}$ to $9\frac{1}{2}$ fathoms, clay. The swinging room is restricted and stern moorings to the shore are required. Several islets and dangers front the coast on both sides of the entrance. A 5-foot patch, marked on its southeastern and western sides by spar buoys, lies close southward of the easternmost of these islets.

Stjärnödde (Stiärnödde), about 1 mile eastward of the entrance of Fanbyviken, has steep, light-colored sides and is wooded on

top. From seaward the point and the coast northward of it appear higher than Skagsudde.

Degerfjärden is a large bay between Stjärnödde and Långroudde, a low, wooded point about $8\frac{1}{2}$ miles northeastward. Numerous shoal patches with depths of 2 feet to $5\frac{1}{2}$ fathoms are scattered throughout the bay and off its entrance. Stjärnögrund (Stiärnögrund), a $1\frac{1}{2}$ -fathom patch lying about $1\frac{1}{2}$ miles east-northeastward of Stjärnödde, is marked on its eastern side by a spar buoy with a radar reflector. There is anchorage, accessible to vessels of any draft, in $9\frac{1}{2}$ fathoms, sand, north-northwestward of Boskär, an islet on the eastern side of Degerbukten at the head of Degerfjärden. Southerly winds cause a swell to set into the anchorage. Vessels approaching the anchorage from seaward should pass between Stjärnödde and Stjärnögrund, thence proceed northward on a course about parallel to the western shore of the bay and at a distance of $\frac{1}{2}$ to $\frac{3}{4}$ mile from it. Pilots can be obtained from Skagsudde or Bredskar (sec. 9A-20).

A light is shown on an islet about 5 miles west-northwestward of Storbådan Light.

Nordmalingsfjärden is entered between Långroudde and Järnäsudde (sec. 9A-1), about 4 miles east-northeastward. In the middle of the entrance is Storbådan, a small islet on which stands a lighthouse and some other buildings. Lillbådan (Lillholm), another islet, lies about $\frac{1}{2}$ mile westward of Storbådan. The southern part of the fjord is encumbered with numerous islets and dangers, but in the northern part there is a large clear space with depths of $3\frac{1}{4}$ to 7 fathoms.

Two channels lead into Nordmalingsfjärden, one on either side of the two islets in the middle of the entrance. The channels join about 3 miles northward of Storbådan and a single channel leads to the northern part of the fjord. Vessels with a draft not exceeding 26 feet can, by using the eastern channel, proceed to Notholmen near the head of the

fjord. The western channel is available to vessels with a draft of 13 feet. Vessels should not attempt to enter Nordmalingsfjärden without local knowledge. There is anchorage in 13 to 39 feet, mud, northward of Flåsarna, an islet lying about 6 miles north-northwestward of Storbådan.

7E-16 Navigational aids. — Storbådan

Light is shown on the islet of the same name. A fog signal is sounded at the light. Lights are also shown at Järnäs-Sandö and Kyrkhälludden on the eastern side of Nordmalingsfjärden about $3\frac{1}{4}$ and 4 miles northward of Storbådan. Two range lights are shown at Notholmen.

A beacon stands on Norra Simpan, a shoal close eastward of Långroudde.

Spar buoys, placed in accordance with the uniform system, mark some of the dangers adjacent to the navigable channels.

A light marks a concrete pile in front of the wharf at Rundvik.

A number of obstruction lights are shown occasionally in Northolmen.

Pilots can be obtained from Skagsudde (sec. 7E-12) or Bredskar (sec. 9A-20). Vessels with a draft in excess of 22 feet are not allowed to enter or leave Rundvik during hours of darkness.

Rundvik, a loading place on the western side of Nordmalingsfjärden and about 2 miles from its head, has an anchorage with depths of $14\frac{1}{2}$ to $19\frac{1}{2}$ feet, sand and clay. There is a quay about 360 feet long with depths of $16\frac{1}{2}$ to 25 feet alongside. Other quays, with a total length of about 870

feet, has depths of $8\frac{1}{2}$ to $17\frac{1}{2}$ feet alongside. Tugs and lighters are available. Ship's stores, provisions fuel oil, diesel oil, and water can be obtained. Ice usually closes this loading place to navigation from the beginning of December to the beginning of May.

Notholmen, a loading place at the northern end of Nordmalingsfjärden, has an anchorage with depths of 13 to 39 feet. Vessels at anchor moor their sterns to rings on an islet southward of Notholmen. There is a quay about 490 feet long, with depths of 14 to 16 feet alongside. A channel leading from the fairway to the quay has a depth of 15 feet along the line of the range lights. A 6-inch pipe for discharging tankers is located on the quay. Provisions and fuel oil can be obtained. Minor repairs can be made. Ice usually closes this loading place to navigation from the middle of November to the middle of May.

ANCHORAGES

7E-17 Ulvöhamn.—See section 7E-4.

Edsätterfjärden.—See section 7E-7.

Omnéfjärden.—See section 7E-7.

Ullångerfjärden.—See section 7E-7.

Näske.—See section 7E-8.

Köpmanholmen.—See section 7E-8.

Örnsköldsviksfjärden.—See section 7E-9.

Skagshamn.—See section 7E-13.

Bergöfjärden.—See section 7E-13.

Husum.—See section 7E-14.

Degerfjärden.—See section 7E-15.

Nordmalingsfjärden.—See section 7E-15.

Anchorage at the loading places in the various fjords are described with the related features.

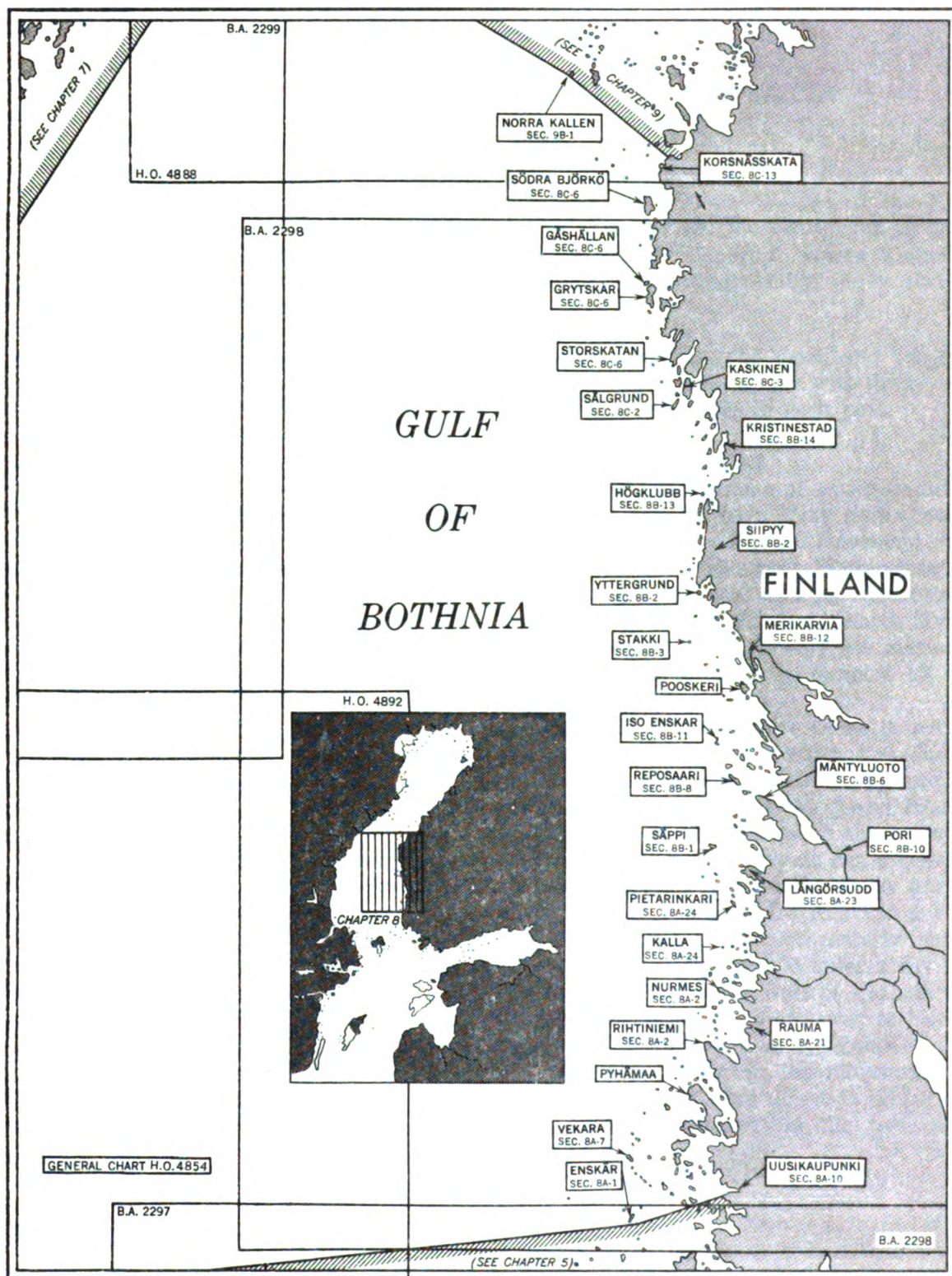


Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Navy Hydrographic Office.

Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 8—GRAPHIC INDEX

CHAPTER 8

WEST COAST OF FINLAND FROM ENSKÄR TO NORRA KALLAN

Part A. Enskär to Säppi

Part B. Säppi to Kaskinen

Part C. Kaskinen to Norra Kallan

Plan.—This chapter describes the west coast of Finland and the contiguous off-lying area situated on the Gulf of Bothnia northward of the Åland Islands, to Norra Kallan in the vicinity of the southern approach to Norra Kvarken. The arrangement of the coastal description is northward from the island of Enskär.

GENERAL REMARKS

8-1 This coastal section extends in a general north-south direction for about 135 miles. The Finnish coast is low and rather difficult to make out from seaward, and is fronted by numerous islands, rocks, and shoals up to 12 miles offshore. It should be noted that this coast has not been completely surveyed and dangers, other than those known, may be presumed to exist. Vessels lacking local knowledge should approach the coast with caution.

The area is quite adequately lighted and buoys and beacons mark the outermost islands, shoals, and rocks; Storkallegrund Light Vessel is stationed near the northern part of this section of the coast.

NAVIGATION

8-2 See section 7-3 for the offshore navigational track coming within the limits of this chapter.

Vessels entering the Gulf of Bothnia from the southward, and bound for Finnish ports covered by this chapter, can proceed on a direct course from a position not less than 2 miles north of Storbrotten Lighted Whistle Buoy (sec. 6B-5) in Södra Kvarken, to the outer approaches of the destination port.

Courses that may be used, and the distances in each case, are given with the related information applicable to each port.

CURRENTS—WINDS

8-3 The great volume of water entering the Gulf of Bothnia from many rivers causes a uniform southerly surface movement during calm weather. This prevailing current in the gulf is the means of causing vessels from Södra Kvarken (sec. 6B-2) to Norra Kvarken (sec. 9C-2) being usually set eastward of their course towards the dangers off the Finnish coast.

Along the Finnish shore there is a current setting to the northward, and during the autumn a branch of the north-moving current sets westward of the Åland Islands and thence towards the Finnish shore. Under normal conditions the current has a velocity of not more than 1 to 2 miles a day during early summer. In the Södra Kvarken during the autumn the north-northeasterly movement may be as much as 6 miles a day. At the light vessels in the Gulf of Bothnia the current has seldom been observed to have a velocity of more than 1 to 1½ knots.

A dominant factor in the movements of the current is the wind direction which can cause great irregularities in the pattern of

the currents in these waters. The currents are not only affected by local winds but also by those blowing, or which have been blowing, in other localities. A change in the current often precedes the striking of a storm by several hours or up to a whole day. During gales the current generally sets with the wind, from 1 to 2 knots in the open sea and from 3 to 4 knots near shore.

For further details see diagrams in chapter 1.

RANGE OF WATER LEVEL

8-4 The tidal range in these waters is of little consequence, but considerable change in the water level may be caused by strong winds, atmospheric pressure, and the seasonal amount of water released by the rivers. A combination of these factors raises or lowers the waters in the Gulf of Bothnia, from the mean water level, by as much as 5 inches although in parts of the gulf it may be more under exceptional circumstances.

ICE

8-5 Ice conditions prevail in the area covered by this chapter. For particulars see section 1-47 and consult the ice chartlets in chapter 1.

Part A. ENSKÄR TO SÄPPI

8A-1 Enskär (Isokari) ($60^{\circ}43' N.$, $21^{\circ}01' E.$) is an island lying in the approaches to Uusikaupunki about $11\frac{1}{2}$ miles west-southwestward of the port. There are numerous dangers in its vicinity, many of which are marked by buoys.

A light is shown on the southwestern side of the island; a radiobeacon is operated from the light house. A light in range 342° with the above light stands on the southern end of the island. A beacon stands $\frac{1}{4}$ mile northwestward of Enskar Light. An unlighted beacon stands on the eastern side of Enskar about $\frac{1}{2}$ mile east-northeastward of Enskar Light.

A pair of unlighted beacons, in range 279° , stands at the eastern side of Enskar on the northern half of the island; a light, about 650 yards south-southeastward of the front range beacon, is shown on Stanggrund (Tankokari), an islet close off the eastern side of Enskar. A spar buoy is moored close northward of Stanggrund. A beacon stands on the western side of the islet.

Pilots are stationed at a yellow building situated on the eastern side of Enskär.

Anchorage may be had on the eastern side of Enskär, sheltered from westerly winds in depths of 6 to 13 fathoms, with Enskär Light bearing 277° ; the bottom is sand and mud.

COAST—GENERAL

8A-2 The coast between Enskär and Säppi, about 45 miles north-northeastward, is almost entirely fronted by foul ground for a considerable distance off the mainland. Islands, islets, rocks, and shoals prevent any possibility of close inshore navigation.

The most outlying conspicuous objects along this coast are the lighthouse on Enskär, the tower on Sandbäcks Norra, about $8\frac{1}{2}$ miles west-northwestward of Enskär, Lyökki Tower, about $13\frac{1}{2}$ miles north-northwestward of Enskär, Rihtiniemi, $10\frac{1}{2}$ miles north-northeastward of Lyökki Tower; the lighthouse on Nurmes Island, about $6\frac{1}{2}$ miles northward of Rihtiniemi; a group of islands about $14\frac{1}{4}$ miles northward of Nurmes Light; and Säppi, about $21\frac{1}{2}$ miles farther northward.

Caution.—Local magnetic disturbances have been reported in $60^{\circ}45' N.$, $21^{\circ}11' E.$, and $60^{\circ}54' N.$, $21^{\circ}05' E.$

DEPTHS—DANGERS—OFF-LYING BANKS AND ISLANDS

8A-3 The depths are uneven along this section of coast and vessels operating within the 30-fathom curve risk the possibility of encountering unsurveyed dangers in some

localities; this contour lies as much as 15 miles offshore.

Enskär is surrounded by foul ground and shoals extend about 1,400 yards northeastward from the northeastern extremity, and about 1,000 yards from the southernmost tip. A spar buoy marks the southern end of the shoal. Several islets and rocks lie on this southerly shoal, Santakari the largest islet being situated close off Enskär.

Nitenkari is an islet close off the eastern side of the island. Two extensive shoals, on which there are rocks, extend northwestward for about $2\frac{1}{4}$ miles from a position close off the northwestern side of Enskär. Two shoal patches, with depths of $3\frac{1}{2}$ and 5 fathoms, lie about $1\frac{1}{3}$ and $1\frac{1}{2}$ miles, respectively, eastward of Enskär Light. The $3\frac{1}{2}$ -fathom patch is marked by a spar buoy.

Kokkari Rocks lie on a shoal area about $2\frac{1}{2}$ miles east-northeastward of the northern end of Enskär; several detached shoals lie up to $1\frac{1}{2}$ miles west-northwestward of the rocks.

Rouskeri Light is shown on the western end of an island located about 4 miles southeastward of Enskär Light. Foul ground extends eastward of this island to the mainland.

In the western approach to Enskär are a number of detached dangers, some are marked by buoys. **Pettersonsgrund**, a shoal patch with a depth of $4\frac{1}{4}$ fathoms lies about 9 miles west-southwestward of Enskär Light. A 4-fathom patch lies close east-southeastward of Pettersonsgrund. A 1-foot shoal lies about 3 miles south-southwestward of Pettersonsgrund.

Merikivi, a patch of rocky bottom with a depth of 4 fathoms, lies about $7\frac{1}{2}$ miles westward of Enskär.

Sandbäcks Södra, a rock about 2 feet high, lying about 1 mile northward of Merikivi, is fringed by a shoal. **Sandbäcks Norra**, awash, lies about $1\frac{1}{2}$ miles northward of Sandbäcks Södra. A tower 33 feet high stands on Sandbäcks Norra; a light is shown from the tower. A shoal patch with a depth of $4\frac{1}{2}$ fathoms, lies about $1\frac{1}{4}$ miles farther southeastward of Sandbäcks Norra, and $1\frac{1}{2}$ miles farther southeastward is a patch with a depth of $1\frac{1}{4}$ fathoms.

About $\frac{1}{2}$ mile north-northeastward of the latter shoal is a $4\frac{1}{4}$ -fathom patch, marked on its northern side by a spar buoy, and about $\frac{1}{2}$ mile southeastward of it is a 2-fathom patch, marked on its eastern side by a spar buoy.

Melandersgrund (Melanderinmatalo), a patch of rocky bottom with a depth of $3\frac{1}{2}$ fathoms, lies nearly $4\frac{1}{2}$ miles westward of Enskär.

Ålandinmatala with a depth of less than 6 feet, lies about 4 miles west-southwestward of Enskär.

Kastegreninmatala, with a depth of 2 fathoms, lies about $\frac{3}{4}$ mile northeastward of Ålandinmatala. **Ljungberginkivi**, with a depth of 4 fathoms and marked by a spar buoy, lies about 2 miles westward of Enskär.

Ahlstedtinmatala, a shoal patch with a depth of $4\frac{1}{4}$ fathoms and marked on its western side by a spar buoy, is located about $5\frac{1}{2}$ miles northwestward of Enskär. **Alfredinmatala**, a patch with a depth of 5 fathoms, lying nearly $1\frac{3}{4}$ miles northwestward of Enskär, is marked on its western side by a spar buoy. A small shoal area with a depth of 1 fathom and marked on its western side by a spar buoy lies about $\frac{3}{4}$ mile westward of Enskär; about $\frac{1}{2}$ mile farther southeastward of the last mentioned shoal lies a 4-fathom patch, marked on its western side by a spar buoy.

Other dangers lying in the approaches to the several ports on this part of the coast will be described with the related features.

NAVIGATION

8A-4 Vessels bound to Uusikaupunki from a position about 2 miles north of Storbrotten Lighted Whistle Buoy may steer 074° for about 48 miles to a position about $1\frac{1}{2}$ miles eastward of Merikivi (sec. 8A-3). This course leads northward of Järngrännorna (sec. 5D-3) and a little less than $\frac{1}{2}$ mile east-northeastward of Enskär Light is in range $089\frac{1}{2}^\circ$ with the beacon $\frac{1}{4}$ mile northwestward of the light, steer in on this range. The course leads over depths of not less than 10 fathoms.

WESTERN APPROACH TO UUSIKAU-PUNKI—AIDS

8A-5 From a position about 4 miles south-eastward of Enskar lighthouse a channel authorized for a draft of 28 feet branches off from the channel described in section 5E-16 authorized for a draft of 29 feet.

This channel leads north-northeastward through a buoyed channel with the light beacons on Laatisteri (60°47' N., 21°12' E.) in range 021°, when about 2 miles from Laatiskeri front light course should be altered to east-northeastward to bring Ristikari and Haaperankari lights, located about 7 and 7 1/2 miles, respectively, east-northeastward of Enskar, in range 058 1/2°.

When about 1 1/4 miles southward of Laatiskeri front range light alter course to bring Kurkunpauha Light, located about 1 mile north-northeastward of Laatiskeri front range light, and Keskitto Light, located one mile further northward, in range 001 1/2°. Steer on this range until Vesikari range lights, located about 2 1/4 and 2 1/2 miles northeastward of Laatiskeri Light, are in range 052°.

Vesikari range leads through a buoyed channel passing northward of Isomatala Light, located about 1 mile southwestward of Vesikari front range light. When about 1/4 mile northward of Isomatala change course to bring Haavaskari and Iso Heinanen lights in range 075° ahead. Haavaskari Light is shown on an island about 1 mile eastward of Vesikari, and Iso Heinanen light is shown from an island about 1/4 mile further eastward.

When about 1/4 mile from Haavaskari, change course to bring Hallaskari and Lepainen beacons, located 1/2 mile and 3/4 mile, respectively, northwestward of Haavaskari, in range astern bearing 312°. When about 3/4 mile south-southeastward of Haavaskari light change course to east-northeastward steering for Sandinkari Light, located about 1 mile southeastward of Haavaskari Light. When close northwestward of Sandinkari bring Ruuhikari range lights in line 227 1/2° astern, which leads to the Rikkihappo company's harbor. Ruuhikari front light is shown on a reef close northeastward of Ruuhikari rear light which is shown on an island about 3/4 mile southwestward of Sandinkari Light.

A buoyed channel, marked by leading light-beacons and authorized for a draft of 16 feet, leads east-northeastward, northward of Hanko, to a position close northward of the eastern end of the bridge joining Hanko to the mainland.

From a position about 7 1/2 miles westward of the unlighted beacon about 1/2 mile east-northeastward of Enskär Light in range 089 1/2° with the beacon 1/4 mile northwestward of the Light leads between Kaste-greninmatala and Ljungberginkivi; thence steer to a position about 1 mile southeastward of Enskär Light where the track for vessels with a draft not exceeding 24 feet leads northeastward through the buoyed channel with Ristikari Light structure and Haanperankari in range 058 1/2°. This channel joins the channel authorized for a draft of 28 feet about 3/4 mile southward of Santkari beacon.

At a point about 3/4 mile eastward of Isomatala Light, a channel authorized for a draft of 23 feet branches southeastward from the main channel passing between Haidus, an island about 1 1/4 miles eastward of Isomatala Light, and Viisastenkari islands, located about 3/4 mile eastward of Isomatala Light. A buoyed channel, with Viisastenkari beacons in range 288° astern, leads westward of Ruuhikari island to about 1/2 mile south-southeastward of that island. Thence steer on a range of 060° ahead to an anchorage about 1/2 mile eastward of Hanko.

Vessels with 20-foot draft may pass southward of Kirsta between the buoys as indicated, and northwestward of Iso Vehanen, 1/2 mile eastward, rejoining the channel for 23-foot draft where it leads southward of Haidus, as afore-mentioned.

From a position on the main channel range, about 2 miles southwestward of Ristikari Light, vessels with a 24-foot draft may proceed northward by a channel which is marked by lighted and unlighted range beacons and by buoys. Ramsö beacons on the southern side of Putsaari, lying about 1 1/4 miles northward, lead between Pitkākari and Shetkhellan on a bearing of about 344° for 1 1/4 miles; alter

heading when the range beacons on Iso Ruskio and Pihljakari, 2 and $3\frac{1}{2}$ miles to the northwestward, respectively, come in line bearing 306° .

Steer on this range for about $1\frac{1}{2}$ miles until the beacons on Pentinletto and Sammo, about $2\frac{3}{4}$ and 4 miles north-northwestward, respectively, are in range $345\frac{1}{2}^\circ$; steer for them on this bearing passing westward of Putsaari and Kiuskeri, about $\frac{3}{4}$ mile farther northward. When Ruskea light beacons are

in range about 016° , proceed on this bearing passing between Pentinletto and the shoal extending northward of Kiuskeri, until the Kiuskeri light beacons come in range $178\frac{1}{2}^\circ$ astern. Steer $358\frac{1}{2}^\circ$ with this range astern, which leads eastward of Sammo and westward of Ruskea, to join the northern approach channel to Uusikaupunki over 1 mile south-southeastward of Lyökki Tower.

A fishing light is shown on Sammo by request.

A beacon stands on Kuivasaari, an islet about 1 mile westward of Ramsö beacons.

From a position nearly $1\frac{1}{2}$ miles southward of Ristikari Light, on the range line for the western part of the channel, vessels with a draft of 24 feet can proceed northwestward by a buoyed channel, passing westward of the unlit beacon on Santkari, an islet about 1,400 yards westward of Kirsta, and proceeding to join the northern approach channel to Uusikaupunki at a position westward of Keskiletto light beacon, situated about $2\frac{1}{4}$ miles northward of Santkari beacon.

From a position nearly 1,100 yards northward of the beacon on the northeastern side of Iso Lamholm, an islet about $\frac{2}{3}$ mile northwestward of Keskiletto, a channel for 24-foot draft, marked by unlighted range beacons and buoys, leads westward and northwestward about $\frac{2}{3}$ mile and 2 miles, respectively, to join the outer 24-foot channel described in section 8A-5.

8A-6 Vessels approaching from northwestward should steer 134° with the light beacon on the southwestern side of Iso Hauteri, an islet $3\frac{1}{4}$ miles south-southeastward of Enskär, in range with the light beacon on Vähä Hauteri, an islet about 1 mile further southeastward. When Medelklubb Light (sec. 5E-16) bears 119° , they should alter course and steer for the light on this heading passing between Ljungberginkivi and a 1-fathom patch about $\frac{3}{4}$ mile westward of Enskär, until reaching the track for vessels from westward about 1 mile south-eastward of Enskär Light.

NORTHERN APPROACH TO UUSIKAUPUNKI—DANGERS—AIDS

8A-7 The conspicuous granite Lyökki Tower ($60^\circ 56' N.$, $21^\circ 08' E.$), 54 feet high, stands on the northern end of an islet about

$11\frac{1}{2}$ miles northwestward of Uusikaupunki. A light is shown from the tower.

Karlinmatala, an area of detached shoals with a least depth of 3 fathoms and marked on its southwestern side by a spar buoy, lies about $5\frac{1}{2}$ miles northwestward of Lyökki Tower. Nearly $\frac{1}{2}$ mile farther northward is Karlssonmatala, a shoal area with a least depth of 2 fathoms and marked on its northern side by a spar buoy. Jonssonmatala, about 1 mile eastward of Karlinmatala, has a least depth of $\frac{3}{4}$ fathom and is marked on its eastern side by a spar buoy. Between these three shoals are several patches with depths of $3\frac{1}{2}$ to 5 fathoms.

Aukkomatala, a shoal with a least depth of $3\frac{1}{2}$ fathoms, lies about $3\frac{1}{3}$ miles northwestward of Lyökki Tower, and Suomenkari, with a depth of $4\frac{1}{4}$ fathoms and marked on its western side by a middle ground buoy, lies about 6 miles west-northwestward of the tower.

Harmaatietot, a number of islets lying on an extensive area of rocks and shoals about $2\frac{2}{3}$ miles south-southwestward of Lyökki Tower, is marked at the southwestern extremity of the foul ground by a spar buoy. Siliö, an islet surrounded by a large area of foul ground, lies about $1\frac{2}{3}$ miles southward of Harmaatietot and is marked on the northern extreme of the foul area by a spar buoy.

Beacons.—Vekara Beacon, stands on Vekara, an island nearly $6\frac{1}{2}$ miles southward of Lyökki Tower.

The rear beacon of a pair of lighted beacons, stands on the northern side of Liesluoto about $3\frac{1}{4}$ miles southeastward of Lyökki Tower; the forward lighted beacon is situated on Liesluodonputaa, about $\frac{1}{2}$ mile westward. These beacons in range bear about 091°

A light beacon is located on Vasikkariputaa, an islet about $\frac{1}{2}$ mile westward of Vasikkari front beacon. A light beacon is located near the eastern extremity of Nurminem, a little over $\frac{1}{2}$ mile southward of the light beacon on Vasikkariputaa. These two lights in range bear 174° .

Vasikkari Beacon, 16 feet high, which comprises the front marker of a range, stands on Vasikkari Island about $3\frac{1}{2}$ miles south-southeastward of Lyökki Tower and consists of a white rectangle on a support with a red vertical stripe; a beacon 20 feet high stands on the island of **Kukkaistenmaa**, about 1,000 feet southeastward of Vasikkari Beacon, and is similar to it. These two beacons in range bear 140° .

Petäjä Tevaluoto range beacons stand on the eastern side of the island of that name which lies about $\frac{2}{3}$ mile southward of the eastern extremity of Nurminem. The front beacon consists of a white triangle, 26 feet high; the rear beacon, about 200 yards southward of the front beacon, consists of a white inverted triangle, 33 feet high. When in range these beacons bear 180° .

The front beacon of a pair of range beacons stands about 1,500 yards south-southeastward of Virpkari; the rear beacon stands on an islet about 1,200 yards farther south-southeastward. These beacons in range bear 156° .

Virpkari, an islet situated about 600 yards southward of Vasikkari has two unlighted beacons, both consisting of a black rectangle with a white vertical stripe on a pillar, the

front beacon 27 feet high and the rear beacon 30 feet high. These two beacons in range bear 354° stern.

The beacon situated on the southeastern side of Lamholm (sec. 8A-5) is a masonry cone on a whitewashed rock, 5 feet high; the beacon on Santkari (sec. 8A-5) consists of a masonry cone, 7 feet high.

8A-8 A buoyed track from northwestward, for vessels with a draft of not more than 24 feet, leads southward of the spar buoy marking the edge of the foul ground extending southwestward of Harmaatietot, northward of the spar buoy marking the edge of the foul ground extending northeastward of Siliö, with the pair of range beacons on Liesluoto and Liesluodonputaa (sec. 8A-7) in line 091° , until the Vasikari and Kukkaistenmaa pair of beacons (sec. 8A-7) come in line bearing 140° . Keep on this range until the range beacons on Vasikkariputaa and Nurminen are in line 180° , then steering for them until the range beacons south-southeastward of Virpkari are in line bearing 156° . Keep them on range until the pair of Virpkari beacons come in line, astern, bearing about 354° , keeping on this stern bearing until about 1,800 yards southward of Virpkari and then continue southward through the buoyed channel between the islands until abeam of the beacon on Keskitietto after passing eastward of Lamholm ($60^{\circ}49'N.$, $21^{\circ}11'E.$).

Once past Lamholm continue southward in the buoyed channel to join the track to Lyperto (sec. 5E-15), and also connect with the main channel to Uusikaupunki.

8A-9 Pilotage.—Pilots for Uusikaupunki may be obtained at Lyökki pilot station, a yellow one-story building with a tower, situated on the western side of the island of Lyökki about 4¼ miles south-southeastward of Lyökki Tower. Vessels from seaward may obtain pilots at Enskar. Pilots are available at Heponiemi. Pilotage is compulsory.

UUSIKAUPUNKI

Position: 60°48'N., 21°24'E.

Depths: Approach channel, 7.3 m (24 ft.).
Anchorage, 7.3 to 10 m (24 to 33 ft.).

At quay, 5.2 m (17 ft.).

8A-10 Uusikaupunki stands principally on the northern side of the port area, and the harbor, lying about 11½ miles east-northeastward of Enskär, consists of a small elongated indentation in the coast. It affords anchorage for a large number of vessels.

Ice.—A 21 year observation period indicates that the port was closed by ice on dates varying between November 30 and January 14 and was reopened on dates ranging from April 3 to May 6. The average date of closing was December 18 and of opening, April 24.

Depths.—Other than in the designated channels the depths are variable with many shoal areas and detached patches, too numerous to describe, lying close off the buoyed and beacons tracks. Drafts of 28 feet can be taken to the outer part of the harbor area in the main western approach channel. The prescribed ranges should be closely followed and the buoys passed as indicated because, as previously stated, the survey along this coast is incomplete and less water or uncharted dangers may exist in the immediate vicinity of these navigational aids and no short-cuts should be undertaken.

Anchorage may be had off the port in depths of 7.3 to 10 m (24 to 33 ft.), clay. A number of small islands lying in the ap-

proaches to the port provide a good sheltered harbor, secure from all winds.

Pilotage.—The pilot station at Uusikaupunki is a yellow one-story building with a flagstaff, situated on the western side of the town. Pilotage is compulsory.

8A-11 Uusikaupunki, with a population of about 4,300 in 1948, is a loading port for lumber and wood products. The port has about 1,132 feet of berthing space with depths of 1.8 to 6.8 m (6 to 22 ft.) alongside. Vessels load to deeper drafts while at anchor in the harbor.

Small repairs can be effected in the port. There is a marine railway whose approximate dimensions are: length of cradle, 230 feet; maximum draft over blocks forward, 11½ feet, and over the blocks aft, 14¾ feet; lifting power, 2,000 tons. Vessels drawing up to 21 feet can approach the railway which extends about 435 feet off the shore; 300 feet of it is on land. There is one stationary crane of 5 to 6 tons capacity.

A floating drydock with a lifting capacity of 5000 tons, a width of 72 feet, and a length of 387 feet is available to ships of nearly 10,000 tons D.W.T. It has two 5-ton cranes and one 13 1/2-ton crane. The fairway leading to the drydock was dredged to 7.6 m (25 1/4 ft.) in 1966.

The town has telephone and telegraphic connections and is connected to the general railroad system. There is passenger steamer service to other Finnish ports. A submarine cable extends from Uusikaupunki across Åland Island to Grisslehamn in Sweden.

COASTAL FEATURES (Continued)

8A-12 Between Uusikaupunki and Rauma, about 20 miles northward, the coast is broken by a number of shallow indentations. The area of islets, rocks, and other dangers lying off the coast decreases in width to the northward; at Rauma this shoal area extends about 7 miles offshore, and is cut by three channels leading to the harbor.

NAVIGATION

8A-13 Vessels bound to Rauma from a position 2 miles north of Storbrödden Lighted Whistle Buoy (sec. 6B-5) may steer 055° for about 64 miles to a position about 10¼ miles 243° from Nurmes Light.

OFF-LYING DANGERS IN APPROACHES TO RAUMA

8A-14 Sekstant, a rocky 7.6 m (4 1/4 fm.) patch, is the outermost of the numerous shoals lying westward of Rihliniemi (sec. 8A-2), and is marked by a middle ground buoy. Raumanmatala lighted whistle buoy is moored close westward of a 14.6 m (8 fm.) shoal patch in a position about 3/4 mile northwestward of Sekstant.

Laurensgrund, about 1 mile east-southeastward of Sekstant, has a depth of 7.6 m (4 1/4 fms.), and is marked on its southern side by a spar buoy.

Relanderinmatala, several shoal patches lying about 3/4 mile northward of Laurensgrund, has a least depth of 5.5 m (3 fms.) which is marked by a spar buoy on its northern side. A 6.5 m (3 1/2 fm.) shoal patch, marked on its northern side by a spar buoy, lies about 700 yards northeastward of Relanderinmatala.

Lodgrund (Fileniusmatala), with a depth of 2.5 m (1 1/4 fm.), marked on its southern side by a spar buoy, lies about 3/4 mile southeastward of Relanderinmatala. An unmarked 6.1 m (3 1/4 fm.) patch lies 1/2 mile westward, and a similar patch, marked on its eastern side by a spar buoy, about 1/2 mile northeastward of Lodgrund.

A shoal patch, with a depth of 8 m (4 1/4 fms.), marked by a middle ground buoy, lies about 2 1/2 miles northward of Lodgrund.

Pipermatala, consisting of several detached shoals having a least depth of 5 m (2 3/4 fms.), lies about 2 miles eastward of Laurensgrund. It is marked by a spar buoy on its western side.

Absalonmatala and Alandsgrund, on which there are respective depths of about 4.5 m (2 1/2 fms.) and 5 m (2 3/4 fms.), lie, respectively, 1/2 mile southeastward and southward of Pipermatala. Between these shoals there are several others with depths of 4.5 to 6 m (2 1/2 to 3 1/3 fms.).

Olsoninmatala, lying about 2 miles southwestward of Alandsgrund, is a 5.2 m (2 3/4 fm.) shoal marked on its western side by a spar buoy.

Valimatala, lying about 7/8 of a mile south-southwestward of Olsoninmatala, is a 8 m (4 1/4 fm.) shoal marked on its western side by a spar buoy. Rudolf, a 7.2 m (3 3/4 fm.) shoal, lies about 1/3 of a mile south-southeastward of Valimatala. Albert, a 4.7 m (2 1/2 fms.) shoal, lies about 1/3 mile west-

northwestward of Rudolf and Kallipuda, a 5.7 m (3 fm.) shoal, lies about 1/4 of a mile north-northwestward of Albert. Each of the above shoal areas is marked by a spar buoy. A 7.2 m (3 3/4 fm.) patch, marked by a spar buoy, lies about 400 yards north-northwestward of Valimatala. A 0.7 m (2 ft.) spot and a 7.6 m (4 1/4 fm.) shoal, marked by a spar buoy on its southwestern side, lies about 1/2 mile and 7/8 of a mile, respectively, west-southwestward of Albert.

Laihonenmatala, an 8.2 m (4 1/2 fm.) shoal patch, lying about 4 miles north-northwestward of Rihliniemi, is marked on its western side by a spar buoy.

Gothardinmatala and Stoltsinmatala which have respective depths of 6.4 m (3 1/2 fms.) and 4.5 m (2 1/2 fms.), lie about 1 1/2 and 2 1/4 miles, respectively, north-northeastward of Laihonengrund; each have a spar buoy marking their northern side.

Appelberginmatala, a rocky patch with a least depth of about 8 m (4 1/4 fms.) and marked by a spar buoy on its western side, lies nearly 3 miles west-northwestward of Nurmes Island Light (sec. 8A-2). Aberginmatala (Obersgrund), a similar patch marked by a middle ground buoy, lies about 1/2 mile south-southwestward of Appelberginmatala.

Nurmeksenmatalikko, an extensive shoal area with a least depth of 1.2 m (4 ft.), lies about 1 1/2 miles west-northwestward of Nurmes Light (61°12'N., 21°20'E.). The eastern side of the shoal is marked by a spar buoy, and the western side of the shoal is marked by two spar buoys, one at the northernmost extreme and one at the southwestern end. A 5-fathom patch lies about 2 2/3 miles west-southwestward of Nurmes Light. The western side of the shoal is marked by two spar buoys, one at the northernmost extreme and one at the southwestern end. A 9.1 m (5 fm.) patch lies about 2 2/3 miles west-southwestward of Nurmes Light.

LIGHTS—BEACONS IN APPROACHES TO RAUMA

8A-15 Santakari Light Beacon (60°56'N., 21°08'E.) stands on Santakari Island, close northward of Lyökki Tower (sec. 8A-2). Kellonkari Light Beacon is shown on an islet of that name about 1 mile northward of Santakari Light Beacon. Santakari and Kellonkari Light Beacons in range 183° indicate the fairway in the buoyed channel between the shoals northward of Kellonkari.

Lyökki Tower and Kellonkari Light Beacon are in range 180°.

Hylkikari, an island about 1 mile north-eastward of Lyökki Tower, has a pair of beacons situated on the western side. The northern beacon is lighted. The southern beacon bears 136°, it is a white quadrantal on red supports with a height of 19 feet.

Lehtikari Beacon, 33 feet high, situated on a barren islet about 1½ miles north-northeastward of Lyökki Tower, consists of a number of poles forming two cones, points together, the upper being smaller, and is topped by a horizontal cask, the upper part of which is black and the lower part white.

Säärenpää Beacon, 18 feet high, situated on a low island about 1¾ miles east-northeastward of Lyökki Tower, consists of a number of poles forming two cones, points together, the upper being the smaller.

Kiveri and Haurunen Beacons, each 10 feet high, with respective distances of 5 and 6 1/4 miles northeastward of Lyökki Tower, consist of white truncated cones. In range they bear 029°.

Pyhämaa and Ihamaa Beacons, both 18 feet high, situated on and northward of the northern end of Pyhämaa, a large island lying about 5 miles southward of Rihtiniemi (sec. 8A-2), each consisting of a white rectangular board with three black vertical stripes, in range, astern, bear 183°.

Santamatala Beacon, situated on a small islet lying about ¼ mile westward of the northern end of Rihtiniemi, and **Pääkari Beacon**, on an islet close northward of the cape, in range bear 241°.

Santakari Tower (61°06' N., 21°17' E.),

61 feet high, situated on an islet 1¼ miles north-northwestward of Rihtiniemi, is a red wooden, hexagonal tower with a pointed roof, topped by a vane.

Sasinkari is an islet about 5 miles southwestward of the northern end of Rihtiniemi. A fishing light is shown on the eastern side of Laitakari, an islet about 2 miles northward of Sasinkari.

Laitakari Beacon, a triangulation tower with a topmark, is located near the center of the islet. There is a black daymark on the seaward side of the beacon.

Truthäll and Haminkari Beacons, situated about ¾ mile eastward and 2 miles north-eastward, respectively, of Santakari Tower, in range bear 036°.

Järviluoto Range Lights are shown on the eastern side of an island of that name about 1 mile westward of Rauma Harbor; in line these lights bear 135 1/2°. Järviluoto range beacons, each consisting of boards with a vertical red stripe on a white background, stand in the middle of the island; in line, these beacons bear 066°.

Satama Range Lights are located on the railroad pier in Rauma Harbor; in line they bear 079°.

Suokari Range Lights, in line bearing 103°, are shown from two islets, the front light situated about 2½ miles southeastward of Nurmes Light, and the rear light located nearly 1 mile east-southeastward of the front light.

Lahikari Range Lights, in line bearing 106°, are shown about 1/2 mile eastward of Järviluoto front light.

Pieni Ruohokari Light is shown on an islet about 1 mile south-southwestward of Suokari front light. **Iso Ruohokari Light** is

situated on an islet close southward of Pieni Ruohokari. A beacon, consisting of a red daymark with a white vertical stripe, also stands on Iso Ruohokari. Pieni Ruohokari Light, Iso Ruohokari Light and the beacon in line bears 168°.

Nurmesluoto Range Lights in range 334° are exhibited about 1 mile southeastward of Nurmes Light.

Valkeakari Range Lights in range 311° are shown from an islet of that name located about 2 miles south-southeastward of Nurmes Light.

Kuuskajaskari Range Lights, in line bearing 252°, are shown on an islet close southward of Iso Ruohokari. A light is also shown on a quay on the eastern side of Kuuskajaskari; a beacon, 13 feet high, consisting of a white square board with a black border, standing on the eastern side of the islet, when in range 307° with the aforementioned light, leads in towards the quay.

Kylmäpihlaja Light is shown on an islet about 3 miles south-southwestward of Nurmes Light; it is equipped with a fog signal and a radiobeacon. When requested by pilots, range lights in line bearing 207°, are shown from two breakwaters on the southeastern side of this islet. Lighted beacons located close northward of Kylmäpihlaja Light and on Pirttiluoto, about 3/4 mile east-southeastward of Kylmäpihlaja, when in range, bear 110°. Lehmaletto light beacon, located on a rock about 1 1/4 miles north-northeastward of Kylmäpihlaja Light, and Iso-Pihlavakari light beacon, located on an islet about 1 mile eastward of the first beacon, in range bear 110°. The two above sets of ranges of 110° are 1 measured mile apart.

Louekari Beacon, on an islet about 3/4 mile northeastward of Santakari Tower, and **Truthäll Beacon** in range bear 160°.

Hylkarta Beacon, situated on the islet of that name about 1 3/4 miles eastward of Santakari Tower, and a beacon close northwestward are in range 138°.

Petäjäkari Beacon and Kiuvaskari Beacon, situated on small islets close eastward of the northern end of Rihtiniemi, in range bear 168°.

RAUMA APPROACHES—DEPTHS

8A-16 The southern approach to Rauma is buoyed and can be used by vessels with a draft of 24 feet through the outer channel, and by those with 10 feet through the inner channel.

The northern approach is marked by lights, beacons, and buoys, and is available for vessels having a draft of 24 feet.

Between the northern and southern approach channels there is another channel leading from the northwestward, marked by unlighted beacons and buoys, which can be used by vessels having a draft of 28 feet. It joins the southern approach channel at a point between Hylkkarranriutta and Leveamatala (sec. 8A-18).

OUTER SOUTHERN APPROACH TO RAUMA

8A-17 A channel for vessels with a draft of 24 feet, continues from a point about 2 1/3 miles southward of Lyokki Beacon, (sec. 8A-5).

With **Nurminen Lighted Beacons** in range astern bearing 174.5°, continue on this line passing about 3/8 of a mile eastward of Lyokki Tower until Hylkkari Beacons can be brought in range astern 137°, passing nearly 1/2 mile westward of Lahdekari beacon.

When **Kellonkari and Santakari Light Beacons** come in line 183° astern, proceed on this line, passing between the buoys marking shoals, for about 3 miles, thence northwestward to bring Lyokki and Kellohair Light Beacons in range 180° astern. This range leads about 1/5 of a mile eastward of the spar buoys marking Albert and Kallipuda shoals and passing a middle ground buoy marking a 7.2 m (23 ft.) spot, thence on course 016.5° passing westward of Olsonimatala. This track is held for about 6 3/4 miles, passing eastward of Lodgrund (sec. 8A-14), until Nurmes Light bears 065°; this track joins the northern seaward approach to Rauma (sec. 8A-19) about 2 1/2 miles west-southwestward of Nurmes Light.

SOUTHERN APPROACH TO RAUMA

8A-18 A channel, available to vessels with local knowledge and not over 10-foot draft, leads northward of Lyokki pilot station (60°52'N., 21°11'E.). At a position about 2 1/4 miles northward of Vasikkariputaas Light Beacon (sec. 8A-7) it trends northeastward, passing about 1,000 feet northwestward of Saarenpaa Beacon (sec. 8A-15) and continuing until Kiveri and Haurustenkari Beacons (sec. 8A-15) are in range 028°, leading through a buoyed shoal area lying off the northwestern end of Pyhämaa (sec. 8A-15).

Thence the channel trends northeastward, passing westward of Haurunen, on which stands a beacon, then north-northeastward with the beacon bearing about 191°, passing eastward of Haurustenkari and a rock about 1/4 mile north-northeastward of it, until Pyhämaa and Ihamaa Beacons (sec. 8A-15) are in range 183°, astern, leading through a buoyed shoal area; thence northward passing about 400 yards westward of Santamatala Beacon (sec. 8A-15).

Here the channel leads northeastward with Truthäll and Haminkari Beacons in range (036°), then it trends east-northeastward to a point between Hylkkarranriutta and Leveamatala, about 2 miles east-southeastward of Santakari Tower (sec. 8A-15). When the range beacons on Järviluoto (sec. 8A-15) come in range 066°, steer on this heading between Hylkkarranriutta and Leveamatala and thence, having proceeded through the buoyed channel, pass northwestward of Järviluoto and eastward to the anchorage.

NORTHERN SEAWARD APPROACH TO RAUMA

8A-19 From a position about 10 1/4 miles 243° from Nurmes Light proceed northeastward to a position northward of Gotthardimatala (sec. 8A-14), thence eastward to a position northward of Stoltsinmatala and bring Suokari lights (sec. 8A-15) in range 103°. Continue on this bearing until the Ruohokari lights (sec. 8A-15) are in range 168°, leading through a narrow buoyed shoal area,

then bringing the Valkeakari lights (sec. 8A-15) in range 311°, astern, until past Ekholm, a 3 3/4 fathom shoal marked by a spar buoy; thence with Järviluoto Range Lights in line 135° leading to about 400 yards northward of Järviluoto; thence eastward to the anchorage.

Vessels coming from the northward can pass between Nurmeksenmatalikko (sec. 8A-14) to the eastward and Appelberginmatala and Åberginmatala to the westward, with Santakari Tower bearing about 171°; thence southeastward with the high wooded island of Kuuskajaskari (sec. 8A-15) bearing about 140° until on the entrance range (103°), and proceed as afore-mentioned.

NORTHWESTERN APPROACH TO RAUMA

8A-20 A channel from seaward, lying between the northern and southern approach channels, is available during daylight to vessels of 28-foot draft.

With Nurmes Light bearing 063°, distant about 10 1/4 miles, proceed on course 063° about 6 miles until the beacon on Kylmäpihlaja and the beacon on Pirttiluoto are in range 110°; this track passes close northwestward of a 4 1/4-fathom shoal marked by a middle ground buoy (sec. 8A-14). Thence alter course to the east-southeastward and steer on the above-mentioned range; this track will clear several detached shoals, some of which are marked by spar buoys. When Louekari and Truthäll beacons are in range 162° steer on this short leg until it intersects the Hylkarta range bearing about 139°. Keep on this latter range until the Petäjäkari and Kiuvasjärvi beacons are in range 168° leading to a junction with the southern approach channel at a position about 1 1/2 miles east-southeastward of Santakari Tower (sec. 8A-15), and proceed as previously outlined.

RAUMA

Position: 61°08' N., 21°30' E.
Depths: Approach channels, 10 to 28 feet.
 Anchorage, 33 feet.
 At piers, 5 feet to 26 feet.
Port plan: See section 8A-22.

8A-21 The port of Rauma has a well sheltered harbor that is accessible for a longer interval during the winter than other Finnish ports in the Gulf of Bothnia.

Ice.—Since the adjacent sea is wide and the archipelago protects the harbor from pack-ice belts, it is not too difficult to keep the port open.

Observations over a period of 31 years indicate that the port was closed by ice on dates varying between December 24 and March 4 and was reopened on dates ranging from March 16 to May 7. The records also indicate that the harbor was kept open to traffic, with the assistances of ice breakers, for nine entire winters during this period.

Harbor.—The harbor area is divided into two parts, the outer harbor (Vähä Hakuni) and the inner harbor. The western part of the outer harbor as far as Laitsaari Pier has a depth of about 24½ feet, the central part between Laitsaari and Levitys' piers is about 21½ feet, and eastward from there the depths decrease from about 20 to 16½ feet. The inner harbor has depths of about 18 feet. There is a pier on the southern side of Kuuskajaskari, approached by a channel authorized for a draft of 15 feet.

Vessels may approach Rauma Roads with a draft not exceeding 27 feet by daylight, or 24 feet at night. Before entering the port itself all vessels are lightened in the roads to a draft of 23 feet 6 inches.

Anchorage may be had northward of Järviuoto in depths of about 33 feet, mud. A number of islands and islets lying in the approaches to the port provide good shelter.

Pipeline.—A submarine water pipeline runs eastward from Kuuskajaskari to Rauma.

Cables.—Several submarine cables are laid across the approach channels to Rauma.

Pilotage.—The pilot station is located on Kylmäpihlaja Island, about 4½ miles west-northwestward of Järviuoto Light. Pilotage is compulsory. Vessels from seaward embark pilots about 3 miles northwestward of Kylmäpihlaja. Vessels approaching by the inner channels may obtain pilots at Reposaari.

A line-throwing apparatus is maintained on Kylmäpihlaja.

8A-22 Rauma, with a population of about 20,250 in 1957, is of considerable importance due to its proximity to the Tampere industrial area and the fact that it is fairly ice-free during the winter. The principal exports are timber, wood pulp, paper and cellulose.

There is a total berthing length of about 7,800 feet at the various piers, with depths alongside ranging from 5 to 26 feet. There are adjoining storage buildings and open storage areas for bulk goods. Rail lines are laid to a number of the piers. There are several mobile cranes with capacities ranging from 3 to 50 tons.

There is a graving dock of which the approximate dimensions are: maximum length, 517 feet; breadth 70 feet; height of sill above bottom of dock, 25 feet. All types of repairs can be accomplished at the adjoining shops. Two tugs are available.

Coal, oil, and water are obtainable, water being delivered to the piers or to vessels at anchor. Fuel oil is delivered by tank cars.

Rauma is served by a railroad and there is steamship service to other Finnish and European ports. Telephone and telegraph connections are maintained.

See section 1-7 regarding deratization.

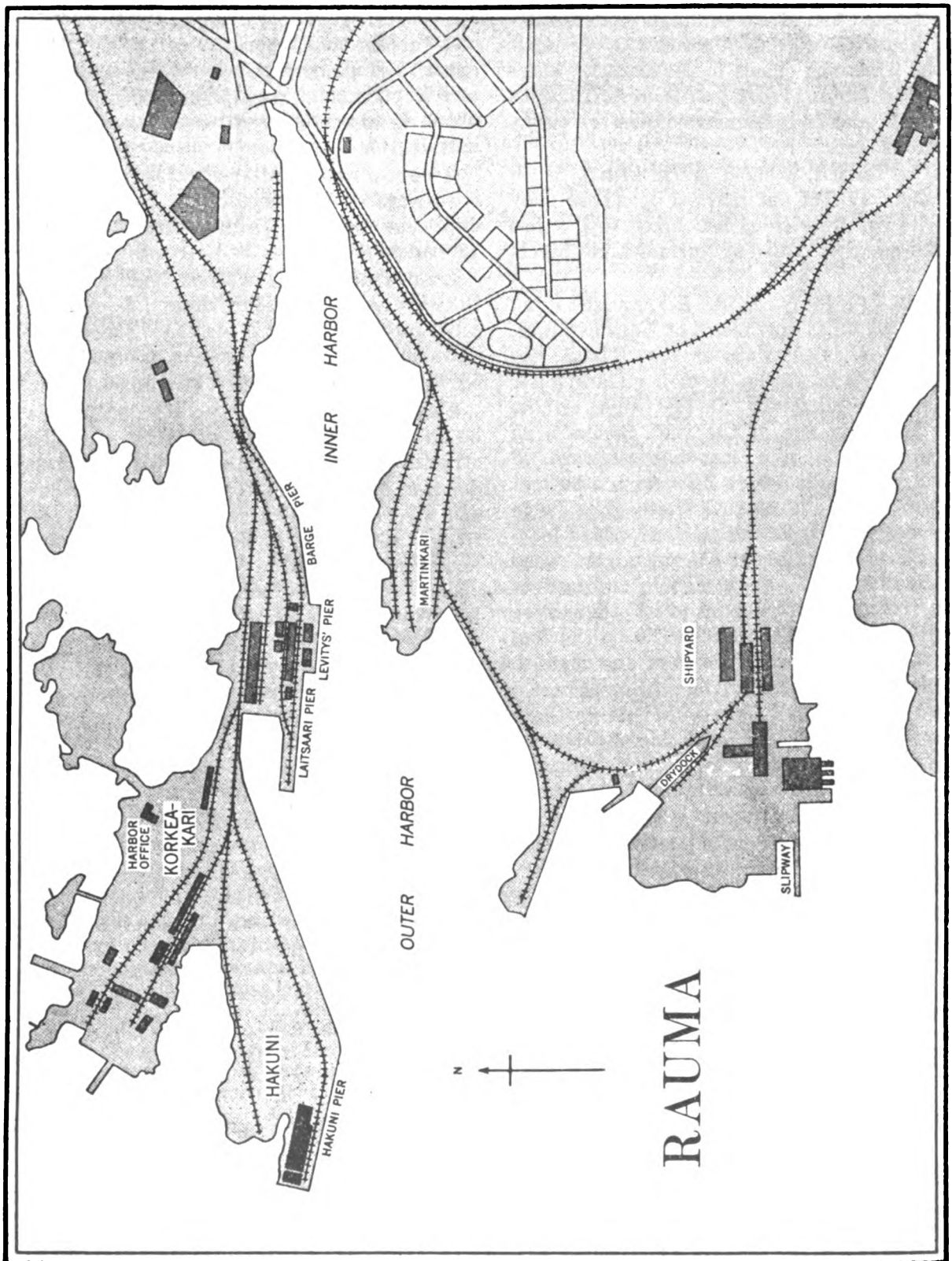
There is a hospital which will accept seamen.

COASTAL FEATURES (Continued)

8A-23 From Rauma the coast northward is low and wooded. Numerous islands and shoals lie up to 6½ miles westward of Långörsudd, a projecting point of the mainland about 14½ miles northward of Nurmes Light structure, a useful landmark in this area; Pietarinkari Beacon, about 9¼ miles northward of Nurmes Light, and Säppi lighthouse, about 8 miles farther northward, are also conspicuous.

DEPTHS—DANGERS—OFF-LYING BANKS AND ISLANDS—AIDS

8A-24 The depths along this part of the coast decrease gradually as the mainland is



approached and afford some aid in determining a vessel's position in relation to the numerous islets and shoals in the area. By keeping in a depth of not less than 22 fathoms a vessel is at least 5 miles outside the outermost dangers.

Ulko Räiskä, a shoal patch with a depth of about 17 feet and marked by a spar buoy on its western side, lies about $4\frac{1}{2}$ miles north-northwestward of Nurmes Light structure.

Kalla ($61^{\circ}16' N.$, $21^{\circ}21' E.$), an islet lying about $4\frac{1}{2}$ miles northward of Nurmes Light, and $1\frac{3}{4}$ miles eastward of Ulko Räiskä, has a fishing light shown from a quadrangular framework structure, 31 feet high, on the northernmost end of the islet. **Susikari**, an islet about 1 mile east-southeastward of Kalla, displays a fishing light from a lookout tower, 23 feet in height. These islets lie in the approach to **Kaunissaari**, an island loading place located about $6\frac{1}{2}$ miles northward of Rauma. Local knowledge is required to negotiate the channel in which there is a least depth of 15 feet; rocks lie on the foul ground on the northern side of the channel.

Pietarinkari, an islet lying $4\frac{1}{2}$ miles northward of Kalla, has a beacon on its northern part, 59 feet high, and consisting of a number of poles with red supports forming a pyramid, the upper part enclosed by white planking.

Fransinkari, an island lying about $11\frac{1}{3}$ miles northeastward of Pietarinkari, has a beacon situated near its middle part consisting of a wooden rectangular screen, 36 feet in height. **Pirskeri**, an island $\frac{1}{2}$ mile northeastward of Fransinkari, has a wooden beacon in the form of a pyramid surmounted by a triangle point down. The beacons in line bear about 062° , and lights are occasionally shown from them.

Kuuskari, an island about 2 miles eastward of Pietarinkari, has a pyramidal wooden bea-

con consisting of spars, covered with boards on two sides and topped by a triangle point down. A stone beacon, surmounted by a pole and triangle point up, stands on a large rock about $\frac{3}{4}$ mile west-northwestward of Kuuskari Beacon.

Kreo, an above water rock about 4 miles northward of Pirskeri Beacon, has a beacon on it consisting of a white rectangular screen, 12 feet high.

Lännennaulat, the western extremity of the shoal area extending from **Långörsudd**, consists of a number of detached patches of variable depth. A spar buoy is moored about $\frac{1}{2}$ mile westward of the outermost patch.

Shoals with depths of less than 3 fathoms lie up to $2\frac{3}{4}$ miles westward of **Säppi Light** structure. **Lindgreninmatala**, with a least depth of $2\frac{1}{2}$ fathoms, lies near the outer end and $4\frac{3}{4}$ - and $4\frac{1}{2}$ -fathom patches lie, respectively, about $\frac{1}{2}$ mile northward and 1 mile south-southwestward. Numerous detached shoals exist in the area between **Säppi** and **Lännennaulat**.

INNER CHANNEL—RAUMA TO SÄPPI

8A-25 From a position about $3\frac{1}{4}$ miles northwestward of Nurmes Light structure a buoyed and beacons channel for vessels with a draft of 15 feet leads westward of Ulko Räiskä (sec. 8A-24), thence to a position northwestward of Pietarinkari Beacon. From thereon it enters a confined buoyed channel about 800 yards northward of Pietarinkari, which leads between the islands and shoals to a position close northwestward of the spar buoy marking **Räyhä**, a shoal lying $\frac{3}{4}$ mile eastward of **Säppi**.

Anchorage.—Vessels with local knowledge and a draft of 12 feet can proceed southeastward from a channel eastward of Pirskeri (sec. 8A-24), through a buoyed channel to a loading place off **Luviaj** about $4\frac{1}{2}$ miles south-southeastward of **Langörsudd** (sec. 8A-23), where anchorage may be taken in about 4 fathoms, mud.

NAVIGATION

8A-26 For vessels with a draft of 24 feet, proceeding out of Rauma towards Säppi on an offshore track, from a position about $3\frac{1}{8}$ miles northwestward of Nurmes Light structure, a course of about 351° for nearly $12\frac{1}{4}$ miles leads about $\frac{1}{8}$ mile westward of the spar buoy marking the outer portion of Lännennaulat (sec. 8A-24); thence a course of 009° for nearly 3 miles leads to a position about $4\frac{1}{4}$ miles westward of Säppi Light.

ANCHORAGES

8A-27 Rauma Roads.—See section 8A-21.

Part B. SÄPPI TO KASKINEN

8B-1 Säppi ($61^\circ 29' N.$, $21^\circ 21' E.$) is an island lying in the approaches to Reposaari and Mäntyluoto, about 8 miles south-southwestward of the ports. It is encompassed by foul ground and shoals, several of the latter marked by spar buoys (sec. 8A-24).

A light is shown from the high ground close westward of the center of the island.

A lifesaving station with a line throwing apparatus, is maintained at Säppi.

COAST—GENERAL

8B-2 The low coast between Säppi and Kaskinen, about 54 miles northward, has foul ground extending as much as 10 miles from the mainland. Numerous islands and islets are off-lying.

An excellent shore landmark is the bell tower of the church at Siipyy, about $33\frac{1}{2}$ miles northward of Säppi. The structure is painted yellow with a black roof and steeple.

The lighthouse on the island of Yttergrund, about 3 miles south-southwestward of Siipyy, is also conspicuous.

DEPTHS — DANGERS — OFF-LYING BANKS AND ISLANDS—AIDS

8B-3 The depths are uneven along this section of the coast. Vessels operating between Säppi and Kaskinen can avoid all dangers by contriving to keep, as nearly as possible, in depths of not less than 22 fathoms; these depths lie as much as 15 miles offshore.

Kallo, an islet $7\frac{1}{2}$ miles north-northeastward of Säppi Light, lies in the close approach to Reposaari and Mäntyluoto. A light is shown from a small tower on a yellow gable of a dwelling situated on the northern point of Kallo. A radiobeacon synchronized with a fog signal transmits from a point about 200 yards south of Kallo Light.

Kolmikulma, a shoal with a least depth of 1 foot, lies across the entrance to the channel between Kallo and the southern end of Reposaari, and is marked by two spar buoys on the northern side, one on the eastern, and two on the southern side. The shoal extending from the southern side of Reposaari is marked by a spar buoy. A shoal with a least depth of $3\frac{1}{4}$ fathoms, its northern and southern sides each marked by a spar buoy, lies about $\frac{1}{4}$ mile northward of Kallo Light; about 250 yards northeastward of this shoal is a $4\frac{1}{2}$ -fathom patch, marked on its northern and southern sides by a spar buoy. A spar buoy is moored about $1\frac{1}{4}$ miles south-westward of Kallo Light and marks a wreck having a depth of about 29 feet; a middle ground buoy is moored on a 28-foot patch about $1\frac{3}{4}$ miles west-southwestward of the same light structure.

Kaijankari ($61^{\circ}37' N.$, $21^{\circ}22' E.$), an islet on which a light is shown, lies about 3 miles west-northwestward of Kallo. A reef having a least depth of 1 foot extends about $\frac{1}{4}$ mile southward from it and is marked at its extremity by a spar buoy. This island and reef are covered by a green sector of Kallo Light between the bearings of 106° and 122° . A $4\frac{1}{2}$ fathom patch, marked by a spar buoy on its southwestern side, lies $\frac{3}{4}$ mile south-eastward of Kaijankari. A $3\frac{1}{4}$ fathom patch, marked on its western side by a spar buoy, lies about $\frac{3}{4}$ mile northwestward of Kaijankari.

Northward and northwestward of Kaijankari there is an area of detached shoals on which lie several islets; Hylkiriutta, one of the islets, lies about $2\frac{1}{4}$ miles north-northwestward of Kaijankari.

Sumparbådar, a group of detached shoals with depths of $3\frac{1}{4}$ to 5 fathoms, lying about 8 miles northwestward of Kallo Lighthouse, has the southern, western, and northernmost patches each marked by a spar buoy.

Fädikari, a 25-foot patch marked by a spar buoy, about $5\frac{1}{4}$ miles northward of Hylkiriutta, has a 17-foot patch about $\frac{1}{3}$ mile south-eastward of it. An area of foul ground lies between Fädikari and the mainland, nearly 8 miles eastward.

Karviankivi, a pinnacle rock with a depth of $3\frac{1}{2}$ fathoms, marked by a middle ground buoy, lies about 5 miles north-northwestward of Fädikari.

Rahikari, a small area of detached rocky heads, having a least depth of 17 feet, lies about $1\frac{1}{3}$ miles farther northward of Karviankivi; its eastern and western sides are each marked by a spar buoy.

Karvian Ourat is a group of islands which lie nearly 15 miles north-northwestward of Kallo. **Karvia Beacon**, 47 feet high, is a red four-sided pyramid surmounted by a white diamond shaped top mark standing on an islet of that name at the southern end of Karvian Ourat.

Stakki is the westernmost of the Karvian Ourat group, and can be identified by its

height; it lies about 12 miles northward of Hylkiriutta.

Stakki Range Lights, in allinement bear $084\frac{1}{2}^{\circ}$. The front light, located on Tikkakari Island close northeastward of Stakki, is displayed from the top of a 29-foot white rectangular daymark having a black vertical stripe; the rear light is shown about $1\frac{1}{2}$ mile eastward from a 50-foot white daymark with a black vertical stripe.

Hiidensilta is an area of shoals about $4\frac{1}{2}$ miles in length and 3 miles wide lying north-westward of the Karvian Ourat group. The westernmost patch, with a depth of 16 feet, is marked by a spar buoy, a 15-foot patch on the northern side of the area is similarly marked. A 1-foot patch in the southern part of the area is marked by a spar buoy.

Kasalan Storbåda, an islet surrounded by rocks, lying about $4\frac{3}{4}$ miles northward of Stakki, has a beacon located on it; a spar buoy marks the northwestern edge of the foul ground. A light is shown on Kasalan Storbåda.

Two shoal patches lying nearly 1 mile northwestward and $2\frac{1}{4}$ miles west-northwestward of Kasalan Storbåda have respective depths of 27 and $23\frac{1}{4}$ feet; each is marked on its southern side by a spar buoy.

Rockaboll, a shoal area having a least depth of 4 feet and lying about $6\frac{3}{4}$ miles north-westward of Kasalan Storbåda, has its north-western and southwestern extremes each marked by a spar buoy. There are a number of detached shoals, all unmarked, lying between Kasalan Storbåda and Rockaboll, one of which, **Silverberggrund**, has a depth of about 14 feet.

Höijers Södra ($62^{\circ}06' N.$, $21^{\circ}08' E.$), about $3\frac{1}{2}$ miles northward of Rockaboll, is a shoal patch with a depth of $3\frac{1}{2}$ fathoms and is marked on its western side by a spar buoy. Höijers, about $1\frac{1}{4}$ miles northward of Höijers Södra, has a depth of $2\frac{1}{2}$ fathoms and is marked on its northern side by a spar buoy; between the two shoals there is a $2\frac{1}{2}$ -fathom patch and between

Rockaboll and Höijers Södra there are several patches with depths of $1\frac{1}{2}$ to 5 fathoms.

Mössbåda ($62^{\circ}15'N.$, $21^{\circ}10'E.$) a group of shoals having a least depth of about 2 fathoms, lie in the outer approaches to both Kristinestad and Kaskinen. Its southern side is marked by a spar buoy.

Väster Mössbåda, a 23-foot patch of stony bottom lying about $\frac{1}{4}$ mile northwestward of Mössbåda, is marked on its western side by a spar buoy. Appelberg, an 18-foot patch, lies about $\frac{1}{4}$ mile further northeastward. About $1\frac{1}{4}$ miles northward of Appelberg several shoal patches some marked by spar buoys, lie on either side of the outer approach channel to Kaskinen; Lindstrom, Lybeck, Bummelås, and Witten on the northwestern side have respective depths of 20, 24, $28\frac{3}{4}$ and $8\frac{3}{4}$ feet; Dimitri and Orion on the southeastern side have depths of 15 and 6 feet, respectively. A daybeacon marks Witten shoal.

NAVIGATION

8B-4 Vessels from seaward bound to Mäntyluoto ($61^{\circ}36'N.$, $21^{\circ}29'E.$) from a position 2 miles northward of Storbrotten Lighted Whistle Buoy may steer 044° for about 81 miles to a position about $6\frac{1}{4}$ miles westward of Säppi Light, thence 052° for about 10 miles to a position off the outer entrance channel for vessels of 21-foot draft, or 049° for $11\frac{1}{2}$ miles to a position off the channel for vessels having a 24-foot draft. These courses clear all dangers and lead over a least depth of $5\frac{1}{2}$ fathoms outside the port.

Vessels bound to Mäntyluoto from a position about $4\frac{1}{4}$ miles westward of Säppi (sec. 8B-1) may steer 044° for about $8\frac{1}{2}$ miles to a position $\frac{1}{2}$ mile southward of the buoy marking a 28-foot patch in the approach to the channel for vessels of 21-foot draft.

A course of 040° for about 9 miles leads to a position about $\frac{1}{4}$ mile northward of the same buoy, and southwestward of the approach channel for vessels having a 24-foot draft.

Vessels with a 24-foot draft approaching Mäntyluoto from northward should steer to pass 1 mile westward of the spar buoy marking the western patch of Sumparbådar (sec. 8B-3), thence southeastward about $4\frac{1}{2}$ miles until Kallo Light structure bears 101° , then steer 097° , passing about $\frac{1}{2}$ mile southward of Kaijankari Light structure, to a position southward of the $4\frac{1}{2}$ -fathom patch marked by a spar buoy moored about $\frac{3}{4}$ mile southeastward of Kaijankari Light structure.

Vessels bound to Kaskinen from a position 2 miles south of Storbrotten Lighted Whistle Buoy (sec. 6B-5) may steer 027° for about 120 miles to a position about $\frac{2}{3}$ mile northwestward of the buoy moored on the western side of Väster Mossbada (sec. 8B-3).

Vessels bound to Kristinestad from the position northward of the whistle buoy may steer 028° for about 114 miles to a position about 2 miles west-southwestward of the middle ground buoy moored on Höijerssten, a 20-foot patch lying southward of the outer approach channel to Kristinestad.

Vessels bound to Kaskinen from a position about $4\frac{1}{4}$ miles westward of Säppi Light (sec. 8B-1) may steer 354° for about $33\frac{1}{2}$ miles to a position about 1 mile westward of Rockaboll (sec. 8B-3), thence a course of 004° for about $14\frac{1}{2}$ miles leads to a position about $\frac{2}{3}$ mile northwestward of Väster Mössbåda.

Vessels bound to Kristinestad from a position about $4\frac{1}{4}$ miles westward of Säppi Light (sec. 8B-1) proceed to the position westward of Rockaboll as afore-mentioned, thence 004° for about $4\frac{3}{4}$ miles to a position 1 mile westward of the buoy marking the western side of Höijers Södra (sec. 8B-3), thence about 036° for $4\frac{1}{2}$ miles, passing northward of the buoy marking the northern side of Höijers (sec. 8B-3) which leads to a position about 1 mile west-southwestward of the middle ground buoy moored on Höijerssten.

SÄPPI TO MÄNTYLUOTO — INNER CHANNEL

8B-5 From a position about 400 yards northwestward of the spar buoy marking Rähä (sec. 8A-25) the channel for 15-foot draft trends northward until it intersects the outer approach channel to Mäntyluoto for vessels of 21-foot draft. Several buoys marking shoals are moored along this track in accordance with the Finnish uniform system.

MÄNTYLUOTO

Position: 61°36' N., 21°29' E.
Depths: Approach channel 26 feet.
 Anchorage. 23 and 29 feet.
 At quays. 13 to 26 feet.

Port plan: See section 8B-7.

8B-6 The port of Mäntyluoto is an artificial harbor for the island of that name. It serves as a deep water outport for Pori, and is well sheltered and suitable for vessels during the winter.

Ice.—The harbor of Mäntyluoto is closed by ice for only a comparatively short time in winter, and in very favorable winters is never closed. This is due to the area of open sea on one side and the currents set-up in the inner side by the discharge of the Kokemäenjoki at the head of the bight. Government ice-breakers are available if required. The harbor office can furnish telegraphic information concerning ice conditions.

Depths.—There are ample depths in the recommended tracks from seaward up to the immediate approaches to the port, with not less than 6 fathoms off the entrance channels.

The entrance channel was dredged to a depth of 26 feet (1963).

Harbor depths range from 18 to 26 feet.

Lights—Beacons.—The light on Kallo is mentioned in section 8B-3.

A light is shown from a beacon on Uniluoto about $\frac{1}{2}$ mile southeastward of Kallo light-house; these two structures are in range $124\frac{1}{2}^\circ$.

A light is shown near the southeastern end of Reposaari.

The light on Pyykari, an islet about $2\frac{2}{3}$ miles northeastward of Kallo, and Tiepenger Light, shown from a beacon in the bay about $1\frac{2}{3}$ miles northeastward of Kallo, in line 051° — 231° form an entrance range.

A pair of range lights are shown from Tytly, situated nearly 2 miles north-northeastward of Mäntyluoto. In range 311° they lead toward Pori.

A pair of lights are shown on the northern side of Mäntyluoto, one from the western end of the detached breakwater and the other about 400 yards southeastward. These lights in range 127° lead toward the harbor entrance.

An unlighted beacon stands on the northwestern corner of the head of the mole.

A sewer outfall extends offshore about $2\frac{1}{3}$ miles west-southwestward from about $\frac{1}{4}$ mile southeastward of the light beacon on Uniluoto.

Harbor.—The artificial harbor of Mäntyluoto is formed by a stone mole on the western side, about 935 feet in length, and a quay about 2,300 feet long on the southern side; the eastern end of the harbor has about an 800-foot length of quay extending north-westward. A detached breakwater has its western end lying nearly 250 yards eastward of the head of the mole. The depths range from 13 feet in the southeastern part to 26 feet alongside the 1,640-foot length of the northern side of Visakkaniemi.

Anchorage.—Anchorage may be had in depths up to 8.8 m (29 ft.), mud, in an area from 1/2 mile north-northeastward of Kallo Light structure. In the outer road strong winds from southwest to west send in heavy seas; farther in there is shelter from all but southeast winds in depths up to 6.4 m (21 ft.).

Several underwater cables and an underwater pipeline lie in an area where anchorage is prohibited between Mäntyluoto, Kallo and Reposaari.

Pilotage.—Vessels from seaward can obtain pilots from the Mäntyluoto pilot station at Kallo; those using the inner channels from southward can obtain pilots from Rauma.

Directions.—Vessels approaching Mäntyluoto should steer to pass northwestward of the spar buoy moored about 1¼ miles southwestward of Kallo and Kolmikulma, with Tiepenger and Pyykari lights in range 051°.

Vessels proceeding to an anchorage continue on this range until the unlighted beacon on the northwestern corner of the mole head at Mäntyluoto bears 116° and then steer north-northeastward for about 300 yards and anchor close westward of the channel in about 8.8 m (29 ft.); vessels of lesser draft may continue farther northward and anchor in depths of 7 m (23 ft.).

Vessels bound to the harbor of Mäntyluoto may continue on the afore-mentioned range until the Mäntyluoto range lights are in line (127°), passing between the buoys on either side of the channel leading to the entrance of the harbor.

Harbor regulations.—A copy of the harbor regulations, printed in several languages, should be obtained from the harbor office.

The following are summarized extracts taken from them:

1. On arrival the vessel's colors are to be displayed until arrival has been reported.

2. Vessels carrying more than 10 kilos. of explosives must anchor in the outer harbor.

FACILITIES

8B-7 Mäntyluoto, situated nearly 12½ miles from Pori, serves as a seaport for that commercially important town. The principal exports are wood products of various kinds, paper pulp and paper. A village is situated southeastward of the port area.

Quays.—There is approximately 6,000 feet of quays in the port. All quays are served by the railroad as are the transit sheds and warehouses; there are numerous spur tracks and sidings to handle the traffic of the port.

Cranes on the quays consist of four 3-ton, two 5-ton, two 6-ton, all movable, and one 25-ton stationary hand crane. Tugs and lighters are maintained at the port. One tug is equipped as an ice-breaker and another has diving gear and pumps for salvage work.

Supplies.—Provisions and water are obtainable and a supply of bunker coal is kept on hand.

Communications.—There is postal, telephone, and telegraph service. Several passenger trains are operated daily between Mäntyluoto and Pori, the latter being connected to the general railroad system.

Deratization.—See section 1-7.

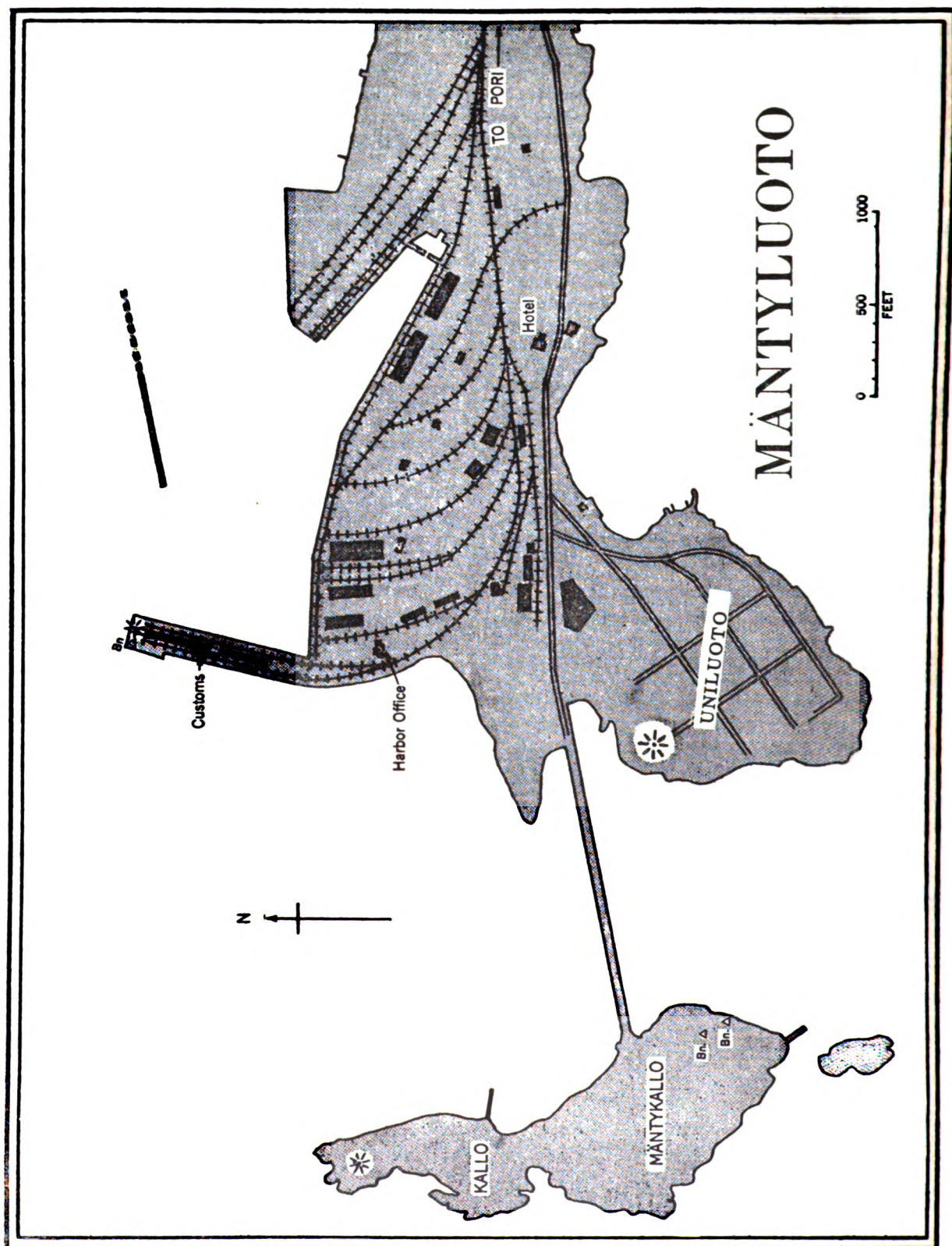
REPOSAARI

Position: 61°37'N., 21°27'E.

Depths: Approach channels, 5.2, 7.3 m (17, 24 ft.) and 8.2 m (27 ft.). Anchorage, 7 m (23 ft.) and 8.8 m (29 ft.). At quays, 2.1 to 3.6 m (7 to 12 ft.).

8B-8 Reposaari, the town and port, is situated on the eastern side of the island of the same name. It is an outport for Pori and vessels are loaded in the roads from lighters.

Ice.—The same ice conditions apply for Reposaari as for Mäntyluoto (sec. 8B-6).



Depths.—There are depths in the indicated entrance channels for vessels having drafts of either 21 or 24 feet. In the closer approaches to the port there are depths in the channel for vessels of 10-foot draft. The quays at Reposaari have about 2.1 to 3.6 m (7 to 12 ft.) alongside and are used principally by coasters.

Lights.—A pair of lights in range $305\frac{1}{2}^{\circ}$ are shown on the quays at Reposaari.

Anchorage.—There is anchorage for about 150 vessels in Reposaari Roads. See section 8B-6.

Pilotage.—See section 8B-6.

Directions.—Vessels with a draft not exceeding 24 feet bound for the roadstead eastward of Reposaari should use the northern entrance channel, passing northward of Kolmikulma shoal on the Kallo-Uniluoto range (124°). Continue on this range until Tiepen-ger and Pyykari lights are in range (051°), steering for them on that bearing until the unlighted beacon on the northwestern corner of the mole head at Mäntyluoto bears 116° . Then proceed to the anchorage as directed in section 8B-6.

Lifesaving.—A lifeboat is maintained at Reposaari.

Harbor regulations.—See section 8B-6. The Harbor Master at Reposaari is the same official in charge of the port at Mäntyluoto.

8B-9 Reposaari is situated about $\frac{1}{4}$ mile north-westward of Mäntyluoto. There is 820 feet of quayage with depths alongside of 3.9 m (13 ft.) all the principal loading being done in the roads. Fresh water and coal are obtainable. Tugs, including a powerful salvage tug, are available.

8B-10 Pori is situated on the Kokemaenjoki about $12\frac{1}{2}$ miles southeastward of Mäntyluoto. It is one of the principal commercial towns in Finland and is the capitol of the district.

In 1960 the town had a population of about 58,000.

A channel marked by range beacons, buoys, and beacons may be used by vessels with a draft of not over 10 feet. There is about 1,600 feet of quayage in the port with depths of 3 to 3.6 m (10 to 12 ft.) alongside.

Pori is connected to the general railroad system and there is telephone and telegraphic communication. There are two hospitals.

SÄPPI TO KRISTINESTAD — INNER CHANNELS

8B-11 Vessels proceeding northward by the inner buoyed channels from eastward of Säppi (sec. 8A-5) should pass eastward of Kaijankari (sec. 8B-3), thence for vessels with a draft of 15 feet the channel leads northward as far as Siipynniemi, situated about 22 miles northward of Kaijankari.

Vessels with local knowledge and having a draft of 6 feet can proceed northward from Reposaari by a narrow, tortuous, buoyed channel leading northeastward of the island. At a point close southeastward of Vähä Enskeri this channel connects with the one for vessels having a 15 foot draft, mentioned in the preceding paragraph.

Northward of Siipynniemi, for about 3 miles to abreast of Ytterberg, the route can be used by vessels with a draft of 14 feet, but between Ytterberg and Kristinestad, about 14 miles farther northward, a channel for vessels with a draft not exceeding 6 feet leads northward close inshore, and another branch for vessels with a draft of 9 feet leads seaward.

Reposaari to Siipynniemi — Aids.—The channel for vessels with a draft of 15 feet leads from eastward of Kaijankari, thence eastward of Vähä Enskeri and Iso Enskeri, the latter two islets having respective distances of about $2\frac{1}{2}$ and $3\frac{1}{2}$ miles farther northward of Kaijankari.

A light is shown on the southern extremity of Tarhakari a small islet located about 1 mile north-northeastward of Kaijankari. A light is shown on the western side of Tahkoluoto an island close northward of Reposaari. These lights are in range 100° . A pair of light beacons in range 073° stand on Laakari located about 1 mile northeastward of Tarhakari. These ranges lead from west-

ward through a 9.4 m (31 ft.) buoyed channel to the new oil harbor at the northern end of Tahkoluoto. The least depth alongside the quays is 10.9 m (36 ft.). However, the quays are exposed to all winds.

Anchorage can be had in 14.6 m (8 fms.) eastward of Iso Enskeri; there is also anchorage in over 9.1 m (5 fms.) eastward of Vaha Enskeri.

Two range beacons stand on the southeastern side of Vähä Enskeri; the front beacon is of white stone surmounted by a white semicircle and a red triangle, point up; the rear beacon is similar but the triangle is point down; these beacons in range bear 217°. A beacon stands near the middle of the western side of Vähä Enskeri and consists of two white quadrilaterals one above the other, points together, the upper one having a red square patch in the center.

Santakari (61°41' N., 21°24' E.), a small islet situated about ¾ mile northeastward of Iso Enskeri, has a fishing light on its eastern end, and another on the western end, which are shown on occasions; these lights in range bear 105°. Range beacons stand near each of these light structures; the front beacon, 21 feet high, is a white triangle with black edges point up; the rear beacon is a similar triangle point down, 30 feet in height; these beacons in range bear about 105°.

From northeastward of Iso Enskeri the channel trends northwestward between buoys marking the shoals northward of that island, with Santakari range beacons, or light structures, in range astern bearing about 105°; thence with the beacon on the western side of Vähä Enskeri in range astern with the tall red chimney about 3 miles southeastward on Reposaari, seen over the trees bearing 148°, which leads southwestward of a

7 m (3 3/4 fm.) shoal marked by a spar buoy on its southern side about 1 1/4 miles northwestward of Iso Enskeri and also westward of a 3.7 m (2 fm.) shoal marked by a spar buoy on its western side nearly 1 mile farther northwestward; thence westward of the spar buoy marking Fadikari (sec. 8B-3) about 1 1/2 miles farther north-northwestward.

Aspskär, an islet about 4¾ miles northeastward of Iso Enskeri, has two fishing lights situated on it and which are shown in accordance with local requirements; in range they bear about 095°.

From westward of Fadikari the track leads northward, passing eastward of Karviankivi (sec. 8B-3), thence eastward of Rähikari (sec. 8B-3).

Hasakari, an islet, lies about 2/3 mile northeastward of Karvia (sec. 8B-3):

A 1.5 m (5 ft.) channel available for vessels with local knowledge, leads from the main track at a position about 3 1/3 miles south-southwestward of Karvia Beacon to an anchorage in 7.3 m (4 fms.), clay, about 200 yards northward of Hasakari Beacon.

Two fishing lights known as Peipunkari are occasionally shown from locations about 2½ and 3½ miles east-southeastward of Karvia Beacon; in range they bear 080°.

Brändö is a loading place for vessels at anchor southward of the island of that name situated about 4½ miles eastward of Stakki (sec. 8B-3). It is accessible from northward and southward to vessels with local knowledge having respective drafts of 11 and 9 feet. The anchorage is sheltered from all winds.

The track from northward is marked by buoys, lights, and range lights.

The track leading to Brändö from southward branches northeastward from the main track about 3½ miles southwestward of Karvia Beacon, and enters a buoyed channel,

marked by range beacons, about $2\frac{1}{4}$ miles southward of Karvia Beacon. Pilots for this channel may be obtained at the station northward of Karvia.

8B-12 Knöppelgrund Beacon ($61^{\circ}54' N.$, $21^{\circ}24' E.$), 41 feet high, stands on an islet of the same name about 4 miles northeastward of Stakki, and consists of a pole with supports surmounted by a cross, all painted white; it indicates the approach to Riispyy, about $6\frac{1}{2}$ miles northward of Merikarvia.

Two fishing lights are occasionally shown on Marjakari, an islet close southwestward of Knöppelgrund Beacon; these lights are in range 073° .

Iso Truutinkari front range light is shown on an islet about $2\frac{3}{4}$ miles northeastward of Karvia Beacon, and the rear light from an islet close southeastward of the front light; in range they bear 143° .

Varislinna rear light is shown from an island of the same name in a position off the mainland nearly 2 miles east-northeastward of Iso Truutinkari front light structure. Varislinna front light is shown from a small islet about 1 mile west-northwestward of the rear light. Front and rear lights are in range 114° .

Anchorage may be had in a depth of about 12.8 m (42 ft.) in a position about 1 mile south-southwestward of Marjakari, just southward of the channel for vessels with a 24-foot draft; a middle ground buoy marking a 5.8 m (19 ft.) patch is moored about 630 yards northwestward of the anchorage area, and a spar buoy is moored on the southwestern side of a 6.4 m (21 ft.) patch further northwestward.

Malskerinluoto Light Beacon is shown on an islet about 2 miles northwestward of Marjakari. Malskeri Light Beacon is shown on the southwestern point of an island about $\frac{1}{2}$ mile north-northeastward of Malskerinluoto Light; these lights in range bear 028° .

From eastward of Rähikari (sec. 8B-3) the main track leads northward between the

buoys marking Stacken and Smärogat, shoals located $1\frac{1}{6}$ and $\frac{5}{6}$ miles, respectively, west-southwestward of Stakki, and then trends north-northeastward with Malskerinluoto and Malskeri Lights in range (028°), passing eastward of Salamander, a shoal about $1\frac{1}{6}$ miles north-northeastward of Stakki and marked by a spar buoy, and also between detached shoals marked by spar buoys about 3 miles northward of Stakki until Iso Truutinkari Lights come in range (143°).

A fishing light ($61^{\circ}57' N.$, $21^{\circ}21' E.$) is shown occasionally at Kasala, on the mainland about $2\frac{1}{4}$ miles east-northeastward of Kasalan Storbåda. The white sector of this light indicates a channel from seaward for vessels with a 24-foot draft. This channel leads close southward of two shoal patches with depths of 8.2 m ($4\frac{1}{2}$ fms.) and 6.7 m ($3\frac{3}{4}$ fms.) situated about $4\frac{1}{4}$ and $2\frac{3}{4}$ miles westward of Kasala.

From eastward of Kasalan Storbåda Beacon the track continues northward, passing between Silverbergsgrund (sec. 8B-3) and Yttergrund (sec. 8B-2), and thence westward of Siipyynniemi (sec. 8B-11).

The light on Yttergrund ($61^{\circ}59' N.$, $21^{\circ}18' E.$) is situated on the northern part of the island. There is a telephone to Kristinestad.

Siipyyn Satama is a loading place close southward of Siipyynniemi. Vessels with a draft of 9 feet can approach from southward by a buoyed channel which passes close westward of Yttergrund. A beacon on the eastern side of Siipyynniemi in range with the bell tower of the church at Siipy (sec. 8B-2) leads in on a bearing of about 022° to a well sheltered anchorage with a depth of about 5.5 m (18 ft.) which lies on the western side of the channel. Vessels from the inner channels can obtain pilots at Salgrund or Hogklubb.

8B-13 Siipynniemi to Kristinestad—Aids.—The coast between Siipynniemi and Hansnässkata, about 13 miles north-north-eastward, is fronted by a flat of foul ground extending up to $2\frac{1}{2}$ miles offshore in places. A number of islands and islets lie on the flat.

Kiili, about 3 miles northward of Siipynniemi, is a loading place, the roadstead of which can be reached by vessels of 7-foot draft with local guidance.

A fishing light is occasionally shown at Ytterberg, on the mainland, nearly $\frac{1}{2}$ mile northward of Kiili.

Domarklubb fishing light is shown occasionally from an islet about $\frac{1}{2}$ mile west-northwestward of Ytterberg. Domarklubb and Ytterberg lights are in range 105° .

Siipyy Beacon ($62^\circ 03' N.$, $21^\circ 19' E.$), about $\frac{1}{2}$ mile northward of Ytterberg Light structure, is about 27 feet high and consists of a white square screen on two poles. Kyrkoskär Beacon, on the northernmost point of the island of that name, situated about $\frac{1}{4}$ mile westward of Siipyy Beacon, consists of a pole with supports, surmounted by a white mark. Siipyy and Kyrkoskär Beacons in range 117° lead through a buoyed channel from seaward, usable by vessels of 7-foot draft.

A white triangular beacon, 20 feet high, stands on a point about $1\frac{3}{4}$ miles northward of Ytterberg fishing light. A second beacon, painted white with a black vertical stripe, stands in shoal water about $\frac{1}{3}$ mile southwestward from the first. The two beacons are in range 024° and lead through a buoyed channel for vessels with a draft of 4 feet.

From Kyrkoskar there is a buoyed channel, for vessels with a draft of 4 feet, which leads northward between Stanggrund, $2\frac{3}{4}$

miles northward of Siipyy Beacon, and the mainland; thence eastward of Sandskär lying close north-northwestward on which there are two fishing lights in range 090° ; thence eastward of Härkmeri, an islet lying about $1\frac{3}{4}$ miles west-southwestward of Hansnässkata (sec. 8B-14), to a junction with the main channel to Kristinestad.

Pilots can be obtained at Högklubb, an islet close southward of Furuskär. A lifeboat is maintained at Kummelgrund, the island next southward of Högklubb, and a customs tower, 55 feet high, is situated on the eastern part of the northern half of the island.

The track for vessels with a draft of 9 feet, after crossing the flat with Kyrkoskär and Siipyy Beacons in range astern, trends northward, leading between the flat and Höijers shoals (sec. 8B-3), thence southwestward of the middle ground buoy marking Höijerssten (sec. 8B-4), to join the channel to Kristinestad.

KRISTINESTAD

Position: $62^\circ 17' N.$, $21^\circ 24' E.$

Depths: Approach channels, 2.5, 5.8 and 6.1 m (8 $\frac{1}{2}$, 19 and 20 ft.).
Anchorage, 9.1 to 10.9 m (5 to 6 fms.).
At piers, 4.2 to 6.4 m (14 to 21 ft.).

8B-14 Kristinestad has its port situated on the eastern side of a coastal indentation extending nearly 3 miles inland, and consists of an outer and inner road, well sheltered.

Ice.—Over a 30-year period the harbor of Kristinestad was closed by ice on dates varying between November 9 and December 21,

and reopened on dates ranging from April 15 to May 17.

Depths.—In the channel leading toward Kristinestad from the southwestward there are available depths for vessels having a draft of 20 feet; in the channel from the northwestward, passing southward of Mössbåda, there are depths available for vessels with a draft of 20 feet. Vessels with a draft of $8\frac{1}{2}$ feet can enter by a channel passing northward of Murgrund. From the entrance to the outer road the channel to the port area is navigable only by vessels of not over 19-foot draft.

There are depths of 5.8 m (19 ft.) in the inner basin, diminishing to 4.2 m (14 ft.) farther in.

Landmarks.—**Pyhävuori (Bötomsbergen)**, 426 feet high, located about 7 miles eastward of Kristinestad, can be made out at a distance of more than 20 miles offshore; from the southwestward it appears as three separate hills. It is the only high land in the vicinity.

Lights—Beacons.—A tower, 62 feet high, standing on the northern end of Härkmeri (sec. 8B-13) is a square truncated pyramid with a pointed roof, surmounted by a ball; the three seaward sides are painted white, and the inshore side red. A lighted beacon close southward, 36 feet high, consists of a white screen on two poles having lateral supports. A third beacon, known as Harkmeri Front Beacon, is located on the eastern side of the island and close south-southeastward of Harkmeri Beacon. It consists of a white square concrete tower.

Hansnasskata Lighted Beacon is about 1 $\frac{1}{2}$ miles on a line of 071° from Harkmeri Lighted Beacon.

Torngrund Island ($62^\circ 13' N.$, $21^\circ 20' E.$), nearly 1 mile northward of Härkmeri, has a white rectangular beacon with a black vertical center stripe, 33 feet in height, erected on it.

This beacon with Hansnässkata Rear Range Beacon forms a 111° range.

Vastra Karlhamn Light is shown from a black rectangular board on the northern end of Vastra Karlhamn, an island situated about $\frac{1}{2}$ mile southward of Harkeri beacon. In range with Harkeri beacon it bears 201° .

The rear Karlhamn Beacon stands on a rock about $\frac{1}{2}$ mile from, and in range 145° with, the front beacon. It is a 46-foot white rectangular board.

Hansnäs Front Range Beacon is located about $\frac{1}{2}$ mile westward of Hansnässkata Beacon. It is 18 feet high and consists of a white rectangular board with a black vertical stripe. Hansnäs Rear Range Beacon, close southwestward of Hansnässkata Beacon, is 26 feet high and similar to the front range beacon. In range, these beacons bear 083° .

Lappungen front light is shown on a rock about $\frac{1}{2}$ mile northeastward of Harkmeri front light. Sviskarsskatan rear light is shown on a rock about 2 miles east-northeastward of Lappungen front light. In range these lights bear 058° .

Murgrund, an islet situated about $1\frac{1}{2}$ miles northwestward of Torngrund, has a beacon standing on its central part consisting of a quadrantal shape, the upper half black and the lower white; the beacon is 54 feet high.

Saltgrund Beacons on the eastern and western sides of the islet of that name, situated about $1\frac{1}{2}$ miles northward of Torngrund, are 30 and 20 feet high, respectively, and consist of vertical poles with supports, and wooden shapes attached; the upper shapes are black and the lower white.

Storasten front light is shown on a rock about $1\frac{3}{4}$ miles northeastward of Saltgrund front beacon. Storasten rear light is shown on a headland about $\frac{1}{2}$ mile from the front light. These lights in range bear $014\frac{1}{2}^\circ$.

A pair of range lights, in line $186\frac{1}{2}^\circ$, is shown on Vilgrund, and island close to the mainland, about $1\frac{1}{6}$ miles eastward of Saltgrund.

Romarskaten front light is shown about $3/4$ mile northward of Vilgrund, and Romarskaten rear light is shown about 200 yards north-northeastward of the front light. In range the lights bear 024° .

Remmargrund Beacon, 29 feet high, is located about $2/3$ mile northward of Vilgrund on the western side of the channel in the close approach to Kristinestad and consists of a white three-sided pyramid on red supports.

Harbor.—The outer roadstead of Kristinestad is extensive and protected from all winds except that from south-southwest, and this does not raise a heavy sea. The inner roadstead and harbor are well protected from all winds; there is anchorage accommodation for three or four large vessels. The principal quay lies on the eastern side of the harbor about $3/4$ mile northward of Romarskata, the southernmost point of the port area.

Pilotage is compulsory. Kristinestad pilot station is a red house located on Romarskata. Pilots from this station take vessels to sea as far as Höijerssten (sec. 8B-4), Mössbåda (sec. 8B-3), and Sälgrund (sec. 8C-2).

8B-15 Directions.—Vessels approaching Kristinestad from the southwestward should steer for Pyhävuori (sec. 8B-14) on a bearing of 062° . When Härkmeri and Hansnäs-skata Beacons (sec. 8B-14) are in range 071° steer for them on that bearing, passing northward of the middle-ground buoy marking Höijerssten; thence between the buoys marking Storbåda shoal to the northward and Vitus, a shoal, to the southward. Pilots meet vessels westward of Höijerssten. Continue on this range, passing between the buoys moored on Granbergsgrund, a shoal, until Lappungen and Sviskarsskatan range lights (sec. 8B-14) are in range 058° , keeping them

so until Hansnas range beacons come in line 083° ; these latter beacons lead through the narrow buoyed channel northward of Härkmeri. North-northeastward of Härkmeri Tower the channel, marked by ranges and buoys, leads to the outer road of Kristinestad. From hereon there is a dredged channel, indicated by buoys and beacons, leading to the inner basin.

Vessels approaching Kristinestad from the northwestward from a position about 1 mile westward of the southern end of Storgrund ($62^\circ 19' N.$, $21^\circ 05' E.$), should steer south-eastward until Torngrund and Hansnäs-skatan Light Beacon (sec. 8B-14) are in range 111° . Continue on that bearing, passing southward of the buoy marking Väster Mössbåda, the buoy marking the southern end of Mössbåda, and the buoy marking Lodgrund, a 6.5 m (3 $1/2$ fm.) shoal about $2\ 2/3$ miles west-northwestward of Torngrund; thence northward of the buoy $1/2$ mile farther east-southeastward marking the northern end of Norr Storbåda, a shoal with a depth of less than 0.7 m (2 ft.). An 8.2 m (4 $1/2$ fm.) patch lies close southward of this range line about 3 miles west-northwestward of Torngrund Beacon.

When the Vastra Karlhamn Lighted Beacon the Karlhamn unlighted beacon are in range 145° , steer for them on that bearing, passing between the spar buoys marking the eastern side of Norr Storbåda and the western side of Murgrundsbåda, a shoal with a least depth of 5 m (16 ft.) about 1 mile westward of Torngrund; thence eastward of the spar buoys marking the eastern sides of Jansson and Andersson, shoals with respective depths of 2.7 m (1 $1/2$ fms.) and 4.6 m (2 $1/2$ fms.), lying about $1\ 1/4$ and $1\ 1/3$ miles west-southwestward and southwestward, respectively, of Torngrund; thence eastward of Medelgrund buoy, about $1/2$ mile farther southeastward, and alter heading to the Lappungen and Sviskarsskatan range (061°), following directions previously given for vessels approaching from the southwestward and bound for Kristinestad.

A channel for vessels with a draft of 8 1/2 feet leads northward of Murgrund (sec. 8B-14) with Saltgrund Beacons (sec. 8B-14) in range 102°. When within about 1 mile of them the channel turns southeastward and then northeastward between buoys marking the shoals southward of Saltgrund, then joining the main track at the entrance to the outer road.

BOBERGSATAMA, a loading place for timber, is situated about 1/2 mile southward of BOLAND, an islet about 1 1/4 miles east-southeastward of Hogklubb (sec. 8B-13). It is accessible to vessels with a draft of 21 feet as far as Boland and 14 feet southward of that islet. Vessels bound to Bobergsatama from seaward follow the directions for leading through the buoyed channel to close northward of Harkmeri, then steering southeastward, passing northeastward of a high islet about 700 yards southeastward of Harkmeri, and the spar buoy southeastward of it; thence steer southward through the buoyed channel, passing eastward of Boland. Vessels with a draft of 20 feet can anchor about 1/4 mile northward of Boland and those with a draft of 14 feet can anchor about 700 yards southward of the islet.

From a position about 1 mile northward of Boland a branch channel for vessels with 18-foot draft leads in a general south-southwesterly direction to NYHAMN, a loading place about 1/2 mile southeastward of Hogklubb. The channel is buoyed. Vessels with a draft of 12 feet can anchor off Nyhamn.

8B-16 KRISTINESTAD is a town of considerable local importance. The population numbers about 4,000.

In the outer harbor there is a quay about 1,082 feet long, three-fourths of its length being of stone construction, and its continuation of wood; there is a depth of 21 feet alongside. This quay is served by a railroad connected to the general system, and the custom house is located here.

In the inner dredged basin there is a wood quay about 230 feet long with a depth of 17 feet alongside. General depths in the basin are 19 feet.

A private oil quay, 180 feet long, with a depth of 14 feet alongside is located on the western side of the basin. Tugs are available.

Provisions and a limited supply of coal can be obtained. Water and fuel oil is delivered by tank car.

A shipbuilding yard is situated at Kristinestad.

There are telephones and telegraphic facilities in the town.

ANCHORAGES

8B-17 MANTYLUOTO ROADS.—See section 8B-6.

REPOSAARI ROADS.—See section 8B-8.

ISO ENSKAR.—See section 8B-11.

VAHA ENSKAR.—See section 8B-11.

HASAKARI.—See section 8B-11.

BRANDO.—See section 8B-11.

MERIKARVIA ROADS.—See section 8B-12.

SHIPYNN SATAMA.—See section 8B-12.

KRISTINESTAD.—See section 8B-14.

BOBERGSATAMA.—See section 8B-15.

NYHAMN.—See section 8B-15.

PART C. KASKINEN TO NORRA KALLAN

8C-1 KASKINEN HARBOR, lying about 8 miles north-northwestward of Kristinestad, is well sheltered by surrounding islands and islets. Except in the indicated approach channels the adjacent area is shoal and foul for a considerable distance off the port. The approach and entrance channels are adequately lighted and buoyed.

KASKINEN APPROACHES—DEPTHS—AIDS

8C-2 KASKINEN is approached from seaward by a channel available for vessels with a draft of 26 feet as far as the Deep Harbor Quay thence a draft of 23 feet to the wharves. The inner channel from Kristinestad and the south is authorized for a draft of 16 1/2 feet with a branch channel for 9 feet. The inner channel from northward is authorized for a draft of 13 feet.

The main channel leads between numerous shoals, marked by spar buoys (sec. 8B-3), that extend for about 4 1/2 miles south-southwestward of the southern extremity of SALGRUND (62° 20' N., 21° 11' E.). This track passes westward of a 4 1/2-fathom patch

situated about 1 3/4 miles southward of the lighthouse; this shoal is marked on its western side by a SPAR BUOY.

PILOTAGE.—Vessels from seaward can obtain pilots at the SPAR BUOY moored about 3 1/3 miles south-southwestward of Salgrund Light; vessels approaching by the inner channels can obtain them from Hogklubb (sec. 8B-13) or Kristinestad (sec. 8B-14). Pilotage is compulsory. Vessels enter only during daylight hours.

LIGHTS.—BATSKAR fishing light is occasionally shown on the southern extremity of the island of that name about 1,800 yards northwestward of Salgrund (sec. 8B-14).

GASBERGET fishing light is shown as needed on the southern side of GASGRUND about 1 3/4 miles north-northwestward of Batskar fishing light structure.

SALGRUND LIGHT is shown near the southern extremity of Salgrund. A motor-lifeboat is maintained at Salgrund Light.

Range lights bearing 100° in range are occasionally shown about 1 1/2 miles north-northeastward of Salgrund Light.

STOREMMARGRUND front range light is shown about 1/2 mile east-southeastward of Salgrund Light structure. Storremmargrund rear range light is shown on a daymark nearly 2 miles northeastward of the front light. These lights in range bear 035°.

A PAIR OF LIGHTS in range 019° is shown on the southwestern side of Kaskinen.

PAALUSILTA AND MAKASINI RANGE LIGHTS are shown on the western side of Kaskinen. In alinement they bear 008°.

SATAMA RANGE LIGHTS are shown from masts on the northwestern side of Kaskinen. These lights or their structures in range bear 010°.

KASKINEN

Position: 62° 23' N., 21° 14' E.
Depths: Approach channels, 9, 13, 16 1/2 and 26 feet.
 Anchorage, 3 1/2 to 5 fathoms.
 At quays, 10 to 29 1/2 feet.

8C-3 KASKINEN, an island connected at its northern extremity to the mainland by a railroad and highway embankment, has its port area situated on the eastern side of an inlet with the island of ESKILSO forming the western side of the passage.

ICE.—Over a 5-year period the harbor of Kaskinen was closed by ice on dates ranging from November 28 to December 28, and reopened on dates varying from April 25 to May 4.

DEPTHS.—See section 8C-2 for the depths in the several indicated approaches to the port. There are depths of 27 to 30 feet in the outer harbor area, and 23 feet in the inner portion.

HARBOR.—The harbor, lying between the islands of Kaskinen and Eskilso, is well protected from all winds. The greatest distance between the islands is about 1/3 mile. Abreast the middle of the town is a small islet with a white building on it, and close eastward of it is a SPAR BUOY. There is a wharf on the western side of Kaskinen abreast the southern end of Eskilso, and more extensive berthing accommodations on the western side of the town at the northern end.

ANCHORAGE.—Anchorage can be taken in Kaskinen Harbor in a depth of 2 3/4 fathoms, clay, abreast the Customs Wharf off the middle of the town. Vessels with a draft of 10 feet can anchor in depths of 3 1/2 to 4 fathoms, clay, nearly 2 1/2 miles farther northward.

A SUBMARINE CABLE crosses the harbor abreast the middle of the town.

DIRECTIONS.—Vessels from seaward having arrived at a position northwestward of the buoy moored on the western side of Vaster Mossbada (sec. 8B-3) should approach Kaskinen with Storremmargrund Range Lights (sec. 8C-2) or their structures in alinement (035°), which leads northwestward of Appelberg (sec. 8B-3), thence between Lindstrom, Lybeck, Bummelas, and Witten on the northwestern side of the channel, and Dimitri and

Orion on the southeastern side. When Kaskinen Range Lights or their structures come in line (019°), steer for them on that bearing until the Paalusilta Range Lights or structures (sec. 8C-2) are in range (008°). then steer on their alinement.

Vessels of 26-foot draft, continuing to the inner anchorage or the wharves, should pass the buoys as indicated and bring the Satama Range Lights (sec. 8C-2) in line on a short leg when about midway between the wharf on the western side of Kaskinen and the southern end of Eskilsö; thence between buoys moored near midchannel and keeping about in the middle of the passage until off the town.

Vessels approaching from the northward and bound for the southern entrance of Kaskinen Harbor should pass about 1 mile westward of the southern end of Storgrund (sec. 8B-15), thence steer southeastward until Storremmargrund Range Lights are in line (035°) and proceed as previously directed.

There is also an outer channel (sec. 8C-10), for vessels of 13-foot draft, leading from northward to a position off the southern end of Sälgrund and a junction with the channel from seaward. A pair of unlighted range beacons lead between the shoals southwestward of Sälgrund.

An inner channel (sec. 8C-10) available to vessels having a draft of 10 feet, leads northward from Kaskinen.

8C-4 Kaskinen is considered one of the best ports in northern Finland, and vessels are able to enter the harbor day or night.

In 1963 the population was about 1,500.

The wharf on the western side of Kaskinen, abreast the southern end of Eskilsö, has a length of about 855 feet with a depth of 23 feet alongside. A quay on the western side of the town at the northern end has about 1,115 feet of berthing space with depths of 16½ feet at the southern end increasing to 23 feet at the northern end. Deep Harbor Quay has

367 feet of berthing space with a depth of 29½ feet alongside. Timber products of various kinds are the main export items. The wharves are served by a railroad which connects with the Finnish national system.

A powerful tug is available in the port. There are no drydocks or shovards.

Provisions and water can be obtained. Fuel oil and coal is delivered by truck.

Kaskinen has telegraph and telephone facilities.

COAST—GENERAL

8C-5 Northward of Kaskinen the area of islets and shoals that fringe the coast becomes wider, the outermost lying up to 16 miles off the mainland. The coast of the latter is low and wooded, and to passing vessels it has the appearance of being farther away than it really is. There are no harbors of any importance along this particular section.

DEPTHS — DANGERS — OFF-LYING BANKS AND ISLANDS

8C-6 The depths are irregular off this part of the coast, and the charted soundings too scattered to be relied upon during periods of low visibility.

In this area vessels should keep outside the 20-fathom curve for safe navigation; this contour lies as much as 18½ miles off-shore.

Storgrund, a shoal area with a least depth of 13 feet, its northwestern side marked by a spar buoy, lies about 3 miles west-southwestward of Sälgrund Lighthouse. There are a number of detached shoals, with depths of 1½ to 5 fathoms, lying in the intervening area, and two patches, with depths of 25 and 30 feet, are found about 1¾ miles westward and 2½ miles west-southwestward, respectively, of the northern head of Storgrund.

Yttergrund, a patch of stony bottom with a depth of 19 feet, situated about 6¾ miles northwestward of Sälgrund Light, is marked on its western side by a spar buoy.

Fölgrund, about $2\frac{1}{4}$ miles westward of the southern extremity of Storskatan, a peninsula 5 miles northward of Sälgrund Light-house, is the westernmost of a group of rocky islets known as Kaldonskär. Between Yttergrund and the foul ground extending south-westward from Fölgrund there is a shoal with a least depth of 16 feet.

Skomakargrund and **Narkevits**, two shoal patches about $5\frac{1}{2}$ and $6\frac{1}{2}$ miles northwestward of Storskatan, each have depths of $2\frac{1}{2}$ fathoms, and the northern and southern sides of each is marked by a spar buoy.

Grytskär, an island situated about 7 miles north-northwestward of Storskatan, has numerous shoals lying up to $2\frac{1}{2}$ miles northwestward of it, and should be approached with caution.

Gåshällan ($62^{\circ}35' N.$, $21^{\circ}03' E.$), is the westernmost of a group of islets $\frac{1}{2}$ mile northwestward of Grytskär.

Judastenarne, a shoal with a depth of 10 feet, lies about 10 miles northwestward of Gåshällan, and is marked on its western side by a spar buoy.

Eriksson, an extensive shoal area with a least depth of 7 feet, lies about $2\frac{3}{4}$ miles east-northeastward of Judastenarne, and has its northern, eastern, and southern sides each marked by a spar buoy.

Sjögrund ($62^{\circ}48' N.$, $20^{\circ}33' E.$), a shoal with a depth of 4 fathoms lying about $16\frac{1}{2}$ miles off the mainland, is marked on its western side by a spar buoy.

Maximoff, an unmarked shoal patch with a depth of 4 fathoms, lies about 11 miles northwestward of Gåshällan.

Storkallegrund is an extensive flat, the outer part of which lies about 10 miles northwestward of Södra Björkö, an island about 8 miles northward of Gåshällan. Storkallegrund is marked by a lighted buoy.

NAVIGATION

8C-7 Vessels bound out of Kristinestad or Kaskinen, to destinations farther northward in the Gulf of Bothnia, from a position $\frac{2}{3}$ mile northwestward of the buoy moored on the western side of Väster Mössbåda (sec. 8B-3) may steer 312° for about 6 miles to a position with Sälgrund Light (sec. 8C-2) bearing 090° , distant $6\frac{1}{2}$ miles; thence a course of 335° for a distance of about 22 miles leads to a position about $2\frac{1}{2}$ miles west-southwestward of Storkallegrund Light Buoy (sec. 8C-13); thence a course of 354° for about 19 miles leads to a position with Norra Kallan (sec. 9B-1) bearing 090° , distant 5 miles.

See section 9A-5 for a continuation of the navigational track beyond the scope of this chapter.

CURRENTS

8C-8 The current along this stretch of coast has an onshore set. See section 8-3.

LANDMARKS

8C-9 There are no good natural landmarks for this section of the Finnish coast. The most prominent and important objects are Sälgrund Lighthouse (sec. 8C-2), Gåshällan Pilot Station on the islet of that name (sec. 8C-6), and Strömmingsbådan Lighthouse (sec. 9B-1).

KASKINEN TO GÅSHÄLLAN—AIDS

8C-10 The inshore channel between Kaskinen and Gåshällan, about 12 miles north-northwestward is available for vessels with a draft of 10 feet. From Kaskinen the buoyed channel leads northward, passing eastward of Järvö to the entrance to the passage leading southwestward and around the southern end of Storskatan (sec. 8C-6), where it meets the track leading to an anchorage on the

western side of Storskatan. This is a loading place for timber from Nämpnäs, a village situated at the head of an inlet about $2\frac{3}{4}$ miles farther north-northeastward.

Vessels approaching this anchorage from seaward should clear the shoals by passing westward and northward of Storgrund (sec. 8C-6); thence steer to pass westward of the spar buoy marking Strandagryнна and eastward of the spar buoy marking Uno and bring in range the pair of beacons situated on the western side of the southern end of Storskatan.

The front beacon consists of a white rectangle with a red, central, vertical stripe; the rear beacon is similar. These two beacons in range, bearing $016\frac{1}{2}^\circ$, lead westward of the spar buoy marking a 23-foot shoal, then between Svartsten, a black rock marked by a spar buoy on its eastern side, and a buoy marking a $10\frac{1}{2}$ -foot shoal close south-eastward of it at the end of the range line.

From thereon keep the range beacons open slightly to the eastward, passing between buoys marking shoals on the eastern and western sides about $\frac{1}{2}$ mile southwestward of the southern extremity of Storskatan, thence in midchannel between Storskatan on the eastward, and several rocks and two islands to the westward. When about abreast the northern end of these islands anchorage can be had in a depth of about $16\frac{1}{2}$ feet, clay, or vessels may proceed farther in toward Nämpnäs, the depths decreasing gradually.

There is also an outer channel leading southward of Sälgrund for vessels with a maximum draft of 13 feet proceeding northward. Skötgrund Beacon stands on an islet about $3\frac{3}{4}$ miles northwestward of Saltgrund (sec. 8B-14), and consists of a white rectangle with a red, central, vertical stripe, on supports. Björnö Beacon, which is similar, stands on the mainland about $1\frac{1}{3}$ miles

northward of Saltgrund. These two beacons in range, bearing about 123° , lead through the shoals southward of Sälgrund, then when the pair of beacons on the western side of Storskatan come in range, proceed on their alinement to pass westward of Strandagryнна and eastward of Uno as previously outlined.

Truthällan Beacon, 16 feet high, consists of a white screen on supports, standing at the northern end of the island of that name which lies about $\frac{1}{2}$ mile westward of the southern part of Järvö.

Södra Flatskär Beacon ($62^\circ 27' N.$, $21^\circ 08' E.$), on the western side of the northern part of the island of the same name, consists of a white three-sided pyramid covered with planking at the upper part, and topped by a basket. Another beacon stands on the western side of the southern part of Södra Flatskär.

8C-11 Saltgrund Beacon ($62^\circ 27' N.$, $21^\circ 08' E.$), standing on the northern end of a small islet, consists of a pole with supports and surmounted by a diamond shape; the upper part of the pole and the diamond shape are black, and the rest of the beacon white.

From a position close southeastward of the buoy marking Svartsten, two beacons in range lead north-northwestward through a narrow buoyed channel, the front beacon standing on Laklubb, an islet about $2\frac{1}{2}$ miles north-northwestward of the southern extremity of Storskatan, and the rear beacon standing on Uttersgrund, a point of the mainland about 2 miles 350° from the front beacon, when in alinement on that bearing.

Proceed on this range until about abeam of Saltgrund Beacon, changing course when the range beacon on Södra Flatskär and a beacon near the southwestern end of Storskatan come in line, astern, bearing about 143° .

Hold this range for about $1\frac{2}{3}$ miles until the beacon on Rövargrund, consisting of a

screen between two uprights with supports, 43 feet high, the screen painted black and white and the supports red, situated about $1\frac{2}{3}$ miles northward of Södra Flatskär, comes in line astern with the beacon on the northern extremity of Makkara, an island about $\frac{3}{4}$ mile southeastward of Rövargrund. These beacons in range bear 095° . Proceed on this short leg, about $\frac{1}{3}$ mile, until the beacons on the islands of Kaldonskär and Osynesgrund, lying about $1\frac{1}{3}$ and $1\frac{1}{4}$ miles westward of the southern part of Storskatan, come in range bearing about 161° astern.

A fishing light is occasionally shown from a wooden structure on Rövargrund.

The track continues northwestward for nearly $5\frac{1}{4}$ miles, passing between the spar buoys marking Kallan, a shoal with a least depth of 4 feet, and a shoal with a least depth of 6 feet north-northeastward of it.

A fishing light is occasionally shown from a red wooden hut on the southeastern extremity of Märgrund, about $3\frac{3}{4}$ miles north-northwestward of Rövargrund. A beacon also stands on the western side of Märgrund and consists of a white rectangle with a black, central, vertical stripe, 21 feet high.

a post on the southeastern extremity of Märgrund, about $3\frac{3}{4}$ miles north-northwestward of Rövargrund. A beacon also stands on the western side of Märgrund and consists of a white rectangle with a black, central, vertical stripe, 21 feet high.

Långgrund Beacon stands on the southern end of the island of that name, about $\frac{3}{4}$ mile north-northwestward of Märgrund Beacon, and is similar to it. Märgrund and Långgrund Beacons in range bear $160\frac{1}{2}^\circ$.

A light is shown on the northern extremity of Gashällan (sec. 8C-6).

Two range beacons stand on Gashällan, the front beacon consisting of a white rec-

tangle on supports about 200 yards south-southwestward of the fishing light, and the rear beacon a white rectangle on the light post. The two beacons in range bear about 017° . Gryskar range lights are shown about $\frac{1}{2}$ mile southeastward of Gashällan Light, and in range 063° lead from the alignment of Gashällan range beacons to the entrance to the channel leading to Gashällan harbor. The harbor of Gashällan affords good anchorage for small craft with a draft not exceeding 8 feet, in a depth of about 4 fathoms, clay, off the eastern side of the island. The channel, which is entered about 800 yards southward of the island, is buoied.

8C-12 Passing westward of Grytskär the track leads north-northeastward for about $\frac{3}{4}$ mile with the beacons on Gashällan in range (017°). When the Långgrund and Märgrund Beacons come in range astern proceed on a course of $340\frac{1}{2}^\circ$ between Gashällan and the extensive shoal area about 1 mile westward, with depths of 4 feet to 5 fathoms, marked by three spar buoys on its eastern side. About midway between this shoal and Gashällan are patches with depths of 4 to 5 fathoms.

Anchorage may be had by vessels with local knowledge having a draft not exceeding 13 feet, on the western side of the entrance to Tjöbyviken in a depth of $3\frac{1}{4}$ fathoms, about $2\frac{3}{4}$ miles northeastward of Gashällan. The approach channel, which is buoied, leads northwestward of Östra Nygrund, a shoal with a depth of $1\frac{3}{4}$ fathoms, marked by a spar buoy on its western side about $\frac{3}{4}$ mile northwestward of Gashällan; thence the channel leads east-northeastward.

GÅSHÄLLAN TO KORSNÄSKATAN—AIDS

8C-13 The inner channel from a position about $\frac{3}{4}$ mile westward of Gashällan leads

westward of Östra Nygrund. It is available for vessels of 13-foot draft.

A beacon stands on Gråstenar, an islet about 3 miles northward of Gåshällan, and another beacon stands on the small islet of Kobban, about $4\frac{1}{3}$ miles northward of Gåshällan. These two beacons in range bear about 021° and lead between shoals marked by spar buoys about $1\frac{1}{2}$ miles north-northwestward of Gåshällan.

A beacon stands on the northern extremity of an island lying about $\frac{1}{3}$ mile eastward of Gåshällan, and another beacon is situated on Pohjoiskari, an islet $\frac{2}{3}$ mile north-northeastward of Gåshällan. These two beacons in range bear about 149° and lead eastward of Gråstenskalla, a shoal with a least depth of about $17\frac{1}{2}$ feet lying about $3\frac{1}{2}$ miles north-northwestward of Gåshällan, its eastern and western side each marked by a spar buoy; thence between $19\frac{1}{2}$ and 28 foot patches, situated about $5\frac{1}{4}$ miles north-northwestward of Gåshällan. The $19\frac{1}{2}$ -foot patch is marked on its eastern side by a spar buoy.

A light is occasionally shown from an iron framework structure on the northern point of Södra Björkö.

A light is occasionally shown from a wooden framework structure on Lillgrund, an islet about $4\frac{1}{2}$ miles northward of Södra Björkö.

A beacon, 24 feet high, is situated on the eastern side of Svettgrund, an islet about 13 miles northward of Kobban Beacon, and consists of a red four-sided pyramid, planked on the upper part and topped by a horizontal cask, and from which a fishing light is occasionally shown. A beacon, 8 feet high, standing on the northwestern side of Svettgrund, consists of red iron rails surmounted by a white triangle.

Two beacons stand on Moikipaahallar, an island about $1\frac{1}{2}$ miles north-northeastward of Svettgrund. The westernmost beacon, consisting of a platform surmounted by a board painted black, in range 019° with the occasionally lighted beacon situated on the eastern side of Svettgrund, leads north-northeastward through a buoyed channel between shoals to a position about 3 miles westward of Korsnässkata ($62^\circ 48' N.$, $21^\circ 08' E.$), a projection of the mainland; the channel for vessels with a 13-foot draft ends there, and from thereon the inner channel to Vaasa had, in 1956, a depth of only 10 feet.

Storkallegrund Light Buoy is moored about $10\frac{1}{4}$ miles west-southwestward of the northern end of Södra Björkö (sec. 8C-6).

A channel from seaward leads east-northeastward from Storkallegrund Light Buoy, passing northward of Eriksson (sec. 8C-6), with the light structure on Södra Björkö (sec. 8C-6) bearing 065° , until it joins the inner track with the beacons on Svettgrund and Moikipaähallar in range (019°).

Another channel from seaward, passing close southeastward of the spar buoy marking the southern side of Eriksson, leads northeastward with the light structure on Södra Björkö bearing about 049° until it meets the inner track.

ANCHORAGES

8C-14 Kaskinen Harbor.—See section 8C-3.

Nämnäs.—See section 8C-10.

Gåshällan.—See section 8C-12.

Töjbyviken.—See section 8C-12.

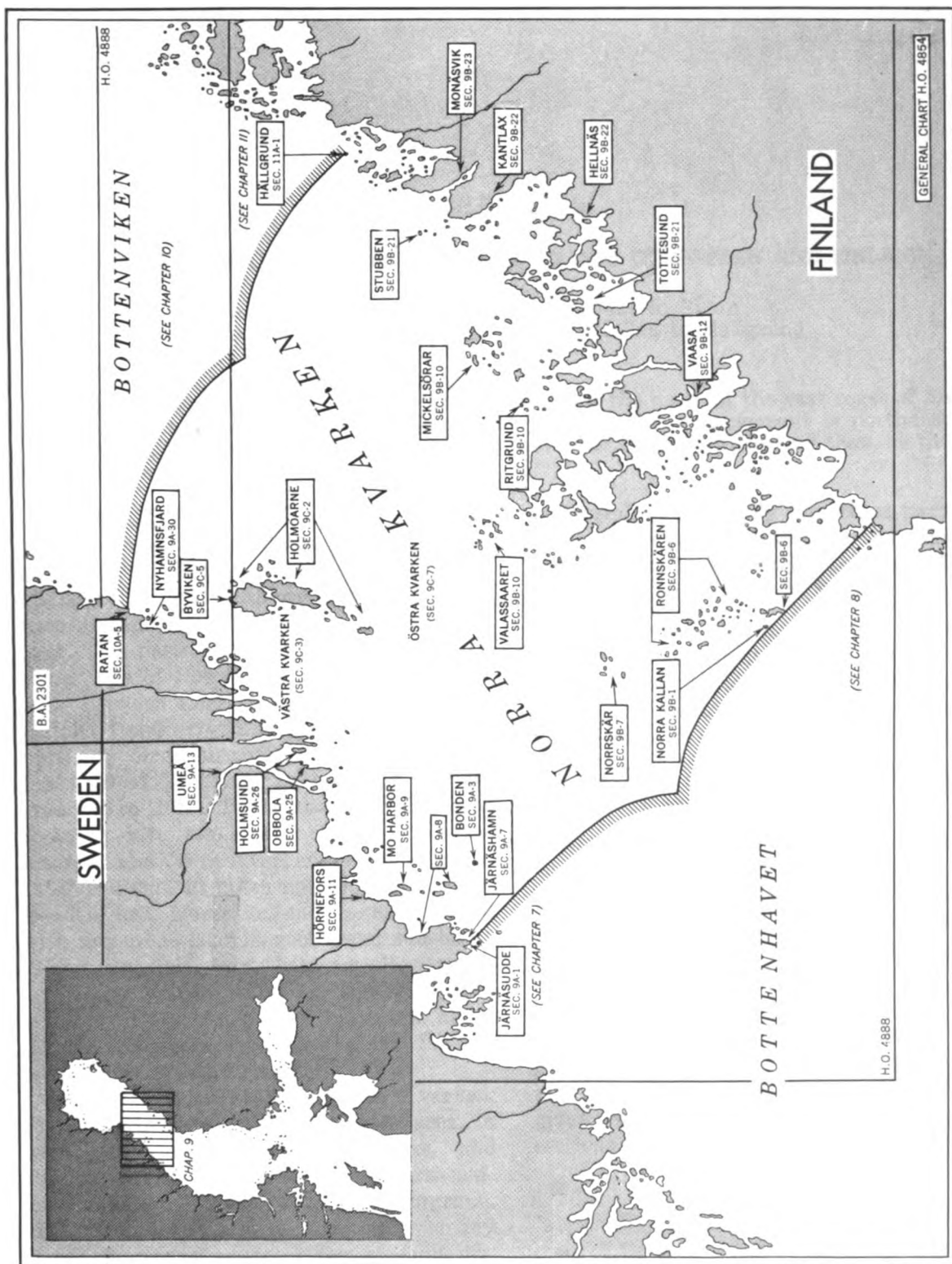


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office. Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 9—GRAPHIC INDEX

CHAPTER 9

NORRA KVARKEN AND THE ADJACENT COASTS OF SWEDEN AND FINLAND

Part A. Coast of Sweden—Järnäsudde to Ratan

Part B. Coast of Finland—Norra Kallan to Hällgrund

Part C. Norra Kvarken

Plan.—This chapter describes Norra Kvarken and the parts of the east coast of Sweden and the west coast of Finland bordering on that passage. The arrangement is northeastward from Järnäsudde, on the Swedish side, thence northeastward from Norra Kallan, on the Finnish side; Norra Kvarken is then described.

GENERAL REMARKS

9-1 Norra Kvarken, the narrowest part of the Gulf of Bothnia, connects Bottenhavet (Selkämeri), the southern part of the gulf, with Bottenviken (Perämeri), the northern part. This passage comprises the waters on either side of Holmöarne, a group of islands lying between 4 and 10 miles off the Swedish mainland and extending about 14 miles in a northerly direction from a position 10 miles eastward of Bredskär, an island in the approaches to Umeå. These islands divide Norra Kvarken into two main channels, Västra Kvarken and Östra Kvarken. Norra Kvarken extends about 40 miles northeastward from Bonden and Norrskär and is encumbered with numerous islands, rocks, and shoals.

The Swedish coast between Järnäsudde and Ratan, about 48 miles northeastward, is indented by fjords, bays and coves. Many detached dangers front the coast. Several rivers flow into the fjords.

On the Finnish side of Norra Kvarken, to the southeastward, an extensive area, in which are numerous islands, rocks, and shoals, extends about 60 miles northeastward between Norra Kallan and Hällgrund. The coast here is also indented by many fjords, bays, and coves. A few streams discharge along this coast.

Several commercially important ports and loading places are located in the inlets on both coasts. The principal ports are Umeå, in Sweden, and Vaasa, in Finland.

The channels leading to the ports are marked by aids. Lights and buoys mark some of the dangers adjacent to the main channels of Norra Kvarken. Two light vessels are also moored in the passage.

Both these coasts are comparatively low and heavily wooded.

Caution.—The coast of Finland bordering on the Gulf of Bothnia has not been thoroughly surveyed. Dangers may exist outside the charted and described off-lying dangers. Strangers should proceed with caution when approaching this coast.

Navigation.—For the navigational track between Södra Kvarken (sec. 6B-2) and Norra Kvarken, see section 7-3. The navigational tracks through Norra Kvarken are given with directions for that passage in sections 9C-6 and 9C-10.

ICE

9-2 Ice conditions prevail in the area covered by this chapter; for particulars and ice chartlets, see chapter 1.

MAGNETIC DISTURBANCE

9-3 Abnormal magnetic conditions are reported in a small area near Bonden (sec. 9A-3).

Part A. COAST OF SWEDEN— JÄRNÄSUDDE TO RATAN

9A-1 Järnäsudde ($68^{\circ}26' N.$, $19^{\circ}39' E.$), the eastern entrance point of Nordmalingsfjärden (sec. 7E-15), is low and wooded.

COAST—GENERAL

9A-2 The Swedish coast trends very irregularly northeastward for about 48 miles between Järnäsudde and Ratan. The approach to Umeå through Österfjärden lies about midway along this section of coast.

Vessels navigating along this part of the coast will normally be approaching the harbors or be passing through Västra Kvarken (sec. 9C-3), the channel between the dangers adjacent to the coast and Holmöarne, the island group to the eastward.

Only the outer dangers and those near the channels will be described.

DEPTHS—DANGERS

9A-3 Depths between Järnäsudde and Ratan are very irregular. The depths among the detached dangers which lie outside those fringing the coast vary from 6 to 50 fathoms. The general depths along recommended tracks from Sydostbrotten Light through Västra Kvarken, and northward to the approach to Ratan, are 10 to 20 fathoms. However, several 6-fathom patches lie near the tracks.

Foul ground fringes the coast, and numerous shoals and rocky patches, lying close together in some places, extend up to 8 miles offshore. Other detached rocks and shoals lie up to 13 miles offshore.

Caution.—Most of the off-lying dangers are steep-to; great caution is necessary when navigating in their vicinity.

Bonden, about $10\frac{1}{2}$ miles eastward of Järnäsudde, is a moderately high, reddish rock, resembling at a distance the ruins of an old castle. A reef extends about 400 yards from its southern side. A light is shown on the rock. A $4\frac{3}{4}$ -fathom patch, marked by a spar buoy, lies about 3 miles northeastward of Bonden.

Caution.—Approaching Bonden within $\frac{1}{3}$ mile between April 15 and August 1 is forbidden except in case of need or authorized permission.

Elinsgrund, a $3\frac{1}{4}$ -fathom shoal marked on its eastern side by a spar buoy, lies $8\frac{1}{2}$ miles south-southwestward of Bonden and about $9\frac{1}{2}$ miles south-eastward of Järnäsudde.

Sydostbrotten, located in the entrance of Norra Kvarken nearly midway between Järnäsudde and the outermost of the dangers extending from the Finnish coast, consists of a chain of steep-to rocks and ledges, some of which are awash. Jahnkesgrund, with a least depth of 3 fathoms and marked on its southeastern side by a spar buoy, lies at the southwestern end of this group about $5\frac{1}{4}$ miles southward of Bonden. Bodénsgrund, with a least depth of $1\frac{1}{4}$ fathoms and marked on its northeastern side by a spar buoy, lies at the northeastern end of the chain about 4 miles east-southeastward of Bonden. The other dangers, which lie between Jahnkesgrund and Bodénsgrund, are: Södra Sydostbrotten, which is awash, Mellersta Sydostbrotten, which is partly awash, and Norra Sydostbrotten, which has a least depth of $1\frac{1}{2}$ fathoms.

Vernersgrund, a shoal with a least depth of 3 fathoms, lies about $3\frac{3}{4}$ miles eastward of Jahnkesgrund and nearly 7 miles south-southeastward of Bonden; Sydostbrotten Light is shown, a fog signal is sounded and a radiobeacon is operated from a tower standing on the shoal. An auxiliary light is shown from the same light structure.

Tufvan, a steep-to, above-water rock, lies about $1\frac{1}{2}$ miles southwestward of **Bonden**. **Sydvästbrötten**, two light-colored rocks a few feet high, lie close together about $1\frac{1}{4}$ miles south-southwestward of **Bonden**; a 8.5 m (4 $\frac{3}{4}$ fm.) patch lies about 800 yards farther southward.

9A-4 Dangers on the western side of Västra Kvarken.—The outermost of the many shoals and rocks which lie off the Swedish coast and form the western side of **Västra Kvarken** are next described.

Gunvorsgrund, a 5.8 m (3 $\frac{1}{4}$ fm.) shoal marked on its southern side by a spar buoy with a radar reflector, lies on the western side of the approach to **Osterfjärden** (sec. 9A-23) about 10 $\frac{1}{2}$ miles south-southeastward of **Bredskar** (sec. 9A-20). One 7.3 m (4 fm.) and two 8.5 m (4 $\frac{3}{4}$ fm.) patches lie within 2 $\frac{3}{4}$ miles west-southwestward, and several 10.9 m (6 fm.) patches lie within 3 miles eastward and northeastward of **Gunvorsgrund**.

Vegagrund, an 8.5 m (4 $\frac{3}{4}$ fm.) shoal marked by a lighted buoy with a radar reflector and a spar buoy, lies 2 $\frac{1}{2}$ miles northward of **Gunvorsgrund**. **Emanuelsggrund**, **Vaktaren**, and the other shoals to the northward in the approach to **Osterfjärden** are described in section 9A-21.

Desterrogrund, a 3.6 m (2 fm.) shoal, lies about 6 miles eastward of **Bredskar**. A spar buoy is moored about 800 yards southeastward of this shoal.

Vantansgrund, an unmarked shoal with a depth of 8.5 m (4 $\frac{3}{4}$ fm.), lies in the approach to **Bjuren** anchorage about 4 miles southward of **Bjuren** (sec. 9A-29).

Ericsggrund, a 6.4 m (3 $\frac{1}{2}$ fm.) shoal marked on its eastern side by a spar buoy, lies about 1 mile north-northeastward of **Vantansgrund**. A spar buoy is moored about 3 $\frac{3}{4}$ miles north-northeastward of the buoy marking **Ericsggrund**. Several shoals, with depths of 6.7 to 10 m (3 $\frac{3}{4}$ to 5 $\frac{1}{2}$ fms.),

lie between the two buoys; the outermost of these shoals, an 8.5 m (4 $\frac{3}{4}$ fm.) patch, lies about 3 miles east-southeastward of **Bjuren**.

Faran, a 3 m (1 $\frac{3}{4}$ fm.) shoal marked on its eastern side by a spar buoy, lies about 1 $\frac{1}{2}$ miles eastward of **Skepparkallen** (sec. 9A-29) and 2 miles west-southwestward of **Bergudden Light** (sec. 9C-4). Several 6.7 m (3 $\frac{3}{4}$ fm.) shoals lie between **Faran** and the spar buoy about 3 miles to the southwestward.

Tarngrund, a group of shoals with a least depth of 3 m (1 $\frac{3}{4}$ fm.), lies about 1 $\frac{1}{2}$ miles west-northwestward of **Bergudden Light**. A spar buoy is moored on the eastern side of the eastern shoal of this group. A 8.2 m (4 $\frac{1}{2}$ fm.) patch lies about $\frac{3}{4}$ mile northward of the buoy.

Svalgrund, a shoal with a depth of 6.4 m (3 $\frac{1}{2}$ fms.) and marked on its southeastern side by a spar buoy, lies 2 miles north-northwestward of **Bergudden Light**.

A 9.1 m (5 fm.) shoal lies close to the fairway of the northern approach to **Västra Kvarken** in a position about 3 $\frac{1}{2}$ miles northward of **Bergudden Light**.

Dangers on the eastern side of **Västra Kvarken** and those extending northward from **Holmoarne** are described with those islands in section 9C-4.

Nidingen, with a depth of 3 m (1 $\frac{3}{4}$ fms.), lies about 1 $\frac{1}{4}$ miles offshore and about 4 $\frac{3}{4}$ miles northward of **Bergudden Light**.

The outermost dangers between the northern entrance of **Västra Kvarken** and **Ratan** are those in the approaches to **Nyhamnsfjärd**. **Rata Storggrund**, lying up to 7 miles offshore eastward of **Ratan**, is described in section 10A-5. Reefs and shoals lie up to $\frac{3}{4}$ mile southward, $1\frac{1}{4}$ miles eastward, and $1\frac{1}{2}$ miles northeastward of **Käringskär** (sec. 9A-30), an islet $6\frac{3}{4}$ miles northward of **Bergudden Light**.

Amiralen, a 1.2 m (4 ft.) shoal, is the outermost danger extending southward from **Kar-**

ingskar; a spar buoy is moored on its southern side in a position about 3/4 mile southward of the islet.

Agrund, a 4.5 m (2 1/2 fm.) shoal marked on its eastern side by a spar buoy, lies about 1 1/4 miles eastward of Karingskar. Buskgrund, with a depth of 4.5 m (2 1/2 fms.), and Olyckan, with a depth of 6.7 m (3 1/4 fms.), lie, respectively, about 1 1/4 and 1 1/2 miles northeastward of Karingskar.

Several other shoals between Käringskär and Ratan lie from 1 mile to 1 1/4 miles off the mainland.

Dangers in the harbors and near the approach channels are described with the related features.

NAVIGATION

9A-5 For the navigational track leading along the Swedish coast from the southwestward to a position about 1 1/2 miles southeastward of Sydostbrodden Light, see section 7E-6. Directions for Västra Kvarken (sec. 9C-6) continue northeastward from this position.

From a position close westward of Ella-grundet Light Buoy (sec. 9C-4), at the northern entrance of Västra Kvarken, a course of 033° for 9 1/2 miles leads over a least depth of 24 m (13 fms.) to a position between Ratan and Rata Storgrund 4 miles eastward of Rata-skär Light (sec. 10A-5).

CURRENTS

9A-6 General current movements in the Gulf of Bothnia are described in chapter 1. Currents in the harbors and approach channels are described with the related features.

COASTAL FEATURES — LANDMARKS

9A-7 The coast between Järnäsudde and Tjäruskärssund, the southwestern entrance of Örefjärden, trends irregularly northeastward for about 4 miles. It is thickly wooded and fronted by several islets and many rocks

and shoals. Storhällan, an islet close off the southeastern side of Järnäsudde, is marked by a white triangular beacon surmounted by a pole and a rectangular top mark. Storklubb is an islet in the entrance of Järnäshamn about 1/2 mile north-northeastward of Storhällan; a red-banded white cairn beacon stands on Storklubb.

Järnäshamn (63°26' N., 19°41' E.) is a small harbor on the eastern side of Järnäsudde. Anchorage can be taken inside the harbor in depths of 3.6 to 7.3 m (2 to 4 fms.) clay and mud. Vessels approaching Järnäshamn may obtain a pilot from Umeå (sec. 9A-14) or Ornskoldsviks (sec. 7E-9) pilot stations. For general information regarding pilotage in Swedish waters see section 1-25.

Navigation.—From a position on the inshore coastal track 2 1/4 miles southward of Järnäsudde (sec. 7E-6), a course of 049° for 1 1/5 miles leads over a least depth of 35 m (19 fms.) to a position on Järnäshamn approach range about 1 1/2 miles southward of the beacon on Storhällan.

Navigational aids.—Approach range lights are occasionally shown on the eastern side of Järnäshamn; entrance range lights are shown on the western side of the harbor. Buoys mark the shorebank on the eastern side of the entrance channel.

Channel.—Vessels with a draft of 14 1/2 feet can use the narrow entrance channel.

Ice obstructs navigation from the middle of December to May.

Dangers in the approaches to Järnäshamn.—Efesgrund, a 6.4 m (3 1/2 fm.) shoal marked on its southern side by a spar buoy with a radar reflector, lies about 4 miles southeastward of Storhällan.

Yttre Järnäsgrund, a shoal awash and marked by a beacon, lies about 2 1/2 miles southeastward of Storhällan. A 4.5 m (2 1/2 fm.) shoal, marked on its southern side by spar buoy, and an 8.3 m (4 1/2 fm.) shoal lie 2 and 4 miles, respectively, eastward of Yttre Järnäsgrund. Two 8.3 m (4 1/2 fm.)

patches lie between Efesgrund and Yttre Järnäsgrund.

Inre Järnäsgrund, a $1\frac{1}{2}$ -fathom shoal marked on its northern side by a spar buoy, and Per Personsgrund, a $3\frac{1}{4}$ -fathom shoal marked on its southern side by a spar buoy, lie $1\frac{1}{4}$ and $1\frac{3}{4}$ miles, respectively, southeastward of Storklubb. A $2\frac{3}{4}$ -fathom shoal, marked by a spar buoy, lies about $2\frac{1}{4}$ miles eastward of Storhällan. A 4-fathom patch lies about 400 yards northward of this latter shoal.

A 3-fathom shoal and Ateliusgrund, a $3\frac{1}{4}$ -fathom shoal, lie, respectively, $\frac{3}{4}$ mile and $\frac{1}{4}$ mile southeastward of the beacon on Storhällan.

Tomashällan, a rock located $\frac{1}{2}$ mile eastward of Storhällan, lies on foul ground extending southward from the eastern entrance point of Järnäshamn. A spar buoy marks the westernmost extension of this foul ground.

Lördagshällan, a rocky patch drying about 1 foot, lies about $6\frac{1}{4}$ miles eastward of Storhällan. A 16-foot-high beacon, its upper part white and its lower part red and surmounted by a radar reflector, stands on Lördagshällan. Numerous shoals, some marked by spar buoys, lie within an area extending about $2\frac{1}{2}$ miles northward and northeastward from Lördagshällan.

Svarthällan, a rock marked by a beacon, is located about $4\frac{1}{2}$ miles northeastward of Storhällan.

Königsgrund, a shoal which is awash near its northeastern end and is marked by spar buoys at its southwestern and northeastern extremities, lies about $1\frac{1}{2}$ miles southward of Svarthällan. A $4\frac{1}{2}$ -fathom patch lies about 600 yards southward of Königsgrund.

Directions for Järnäshamn.—Approach the harbor with the eastern point of Storklubb in range 357° with the houses at the head of the harbor. When about $1\frac{1}{4}$ miles southward of the islet alter course to 000° and enter on the approach range. Pass westward of the 3-fathom shoal located $\frac{3}{4}$ mile southeastward of the beacon on Storhällan, thence

close eastward of Ateliusgrund and close westward of the buoy marking the foul ground extending westward from Tomashällan, thence eastward of Storklubb and, with the inner range light structures in range $322\frac{1}{2}^\circ$, steer into the harbor and to the anchorage, passing westward of two spar Fjärdgrund Light. Numerous dangers lie between Våktaren and Petlandskär, to the northward.

Vessels approaching from the eastward should, after passing Lördagshällan, keep the beacon on that danger in range 084° astern with Bonden Light. This track leads close southward of the $4\frac{1}{2}$ -fathom patch lying southward of Königsgrund and between the spar buoys marking Inre Järnäsgrund and Per Personsgrund. When the beacon on Storklubb is seen midway between Storhällan and Tomashällan, alter course northward and approach Järnäshamn with the eastern point of Storklubb in range with the houses at the head of the harbor as directed above.

9A-8 The coast between Tjäruskärssund and Blågrundsudde, a point about 10 miles northeastward, first trends north-northwestward for about $3\frac{3}{4}$ miles to the mouth of Öreälv, thence irregularly north-northeastward for about $8\frac{1}{4}$ miles to the head of Österfjärden, and thence southeastward for $2\frac{1}{4}$ miles. Many small, shallow inlets indent the coast. Loading places are located at Mo, on the western side of Norrbyskär, and at Hörnefors, to the northward.

Tjäruskärssund, the buoyed sound leading into Örefjärden from the southwestward, is narrow, winding, and has a least fairway depth of 9 feet. Several rocks, awash, lie off its entrance. Pilots are necessary and may be obtained from Skagsudde or Bredskar. Two lights in range 003° mark the entrance channel. Two pole beacons, stand on the small island of Sikhall, on the eastern side of the entrance; in range 178° astern, they lead through the northern reach of the sound and thence through the western part of Örefjärden.

Örefjärden is the area between the mainland and the chain of islands, islets, shoals, and reefs extending southward from Norrbyskär to Snöan. Islets and dangers extending eastward from Tjäruskärssund form the southern side of Örefjärden; numerous dangers, some of them marked by buoys, are found in this area. Öreälv is a stream flowing into the western part of the fjord.

Kylören ($63^{\circ}32' N.$, $19^{\circ}46' E.$), a loading place on the northwestern side of Örefjärden, has two wharves with depths alongside of 7 and 14 feet. **Anchorage**, exposed to southerly winds, can be taken off Kylören in depths of from $2\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, sand and mud. **Ice** obstructs the anchorage from December to the middle of April. **Pilots** are necessary and can be obtained from Skagsudde or Bredskär; vessels leaving obtain them from Järnashamn. The approach from southward (sec. 9A-10) leads close westward of Königsgrund and eastward of the beacon on Svarthällan over a least depth of 27 feet.

Snöan, an island lying about 2 miles north-eastward of Svarthällan, is nearly $1\frac{1}{4}$ miles long, north and south, is of moderate height, and has a flat top and light-colored slopes. A chapel stands near its southern end. A light is shown on the southeastern point of Snöan.

Vapplan is the southern of two islets which are located on foul ground extending nearly 2 miles southward from Blågrundsudde.

The outermost of the many dangers lying off this coast between Lördagshällan (sec. 9A-7) and Vapplan are next described.

Bondlian, a $4\frac{1}{2}$ -fathom shoal, lies about $2\frac{1}{4}$ miles northeastward of Lördagshällan and the same distance west-northwestward of Bonden (sec. 9A-3).

Sörnygrund, with a depth of $1\frac{1}{2}$ fathoms and marked on its western side by a spar buoy, lies about $3\frac{1}{4}$ miles west-northwestward of Bonden.

Mickelsgrund, a $2\frac{1}{4}$ -fathom shoal marked on its eastern side by a spar buoy, lies about $2\frac{1}{2}$ miles northwestward of Bonden; **Jonkrevet**, a 5-fathom shoal, lies about $\frac{3}{5}$ mile farther northwestward. A $4\frac{1}{2}$ -fathom patch lies close northward of Mickelsgrund.

Mattesgrund, with a least depth of 6 feet and marked on its eastern side by a spar buoy, lies about $1\frac{1}{2}$ miles east-northeastward of Snöan Light; **Oloy Ersgrund**, with a depth of $3\frac{1}{4}$ fathoms and marked on its eastern side by a spar buoy, lies about $\frac{3}{4}$ mile farther eastward.

Hasen, a rock awash, lies nearly 4 miles northeastward of Snöan Light. A $4\frac{1}{4}$ -fathom patch, marked on its eastern side by a spar buoy, lies $1\frac{1}{2}$ mile northeastward of the rock.

Lillhasen, with a depth of $1\frac{1}{2}$ fathoms, lies about $\frac{3}{4}$ mile north-northwestward of Hasen; a 5-fathom patch lies midway between them.

Logaren Light is exhibited on a low rock about $3\frac{1}{4}$ miles eastward of Norrbyskar.

Jonkgrund, a shoal with a least depth of $2\frac{1}{2}$ fathoms and marked on its southern side by a spar buoy, lies about $\frac{3}{4}$ mile southeastward of Vapplan; a $4\frac{1}{2}$ -fathom shoal lies the same distance southwestward of the islet.

Norrbyskär, together with its several adjoining islands, lies about $1\frac{1}{4}$ miles offshore on the northeastern side of Örefjärden. The island group is about $1\frac{1}{4}$ miles long, north and south.

MO HARBOR

9A-9 Mo Harbor ($63^{\circ}33' N.$, $19^{\circ}52' E.$) is a loading place on the western side of Norrbyskär.

Navigation.—Deep-draft vessels proceeding eastward from Järnashamn can use either of

two tracks leading among the dangers that lie between Storhällan and Bonden. Both tracks start from a position about $\frac{3}{4}$ mile south-southeastward of the beacon on Storhällan.

The southern track leads about $\frac{1}{4}$ mile southward of the 3-fathom shoal lying $\frac{3}{4}$ mile southeastward of Storhällan, thence southward of Per Personsgrund and close northward of the spar buoy marking the northern side of Inre Järnäsgrund, thence southward of a $4\frac{1}{2}$ -fathom patch lying about 600 yards southward of Königsgrund, thence southward of Lördagshällan, and thence between Bonden and Bondlian.

The northern track passes close southward of the 3-fathom shoal mentioned above, thence southward of Per Personsgrund, thence northward of a 4-fathom patch lying about 400 yards northward of the $2\frac{3}{4}$ -fathom shoal, marked by a spar buoy in a position about $2\frac{1}{4}$ miles eastward of Storhällan, thence southward of Grisselgrund, a 3-fathom shoal, marked on its eastern side by a spar buoy and lying about 1 mile southward of Svarthällan, thence between the spar buoys marking, respectively, the northern end of Königsgrund and a $1\frac{3}{4}$ -fathom patch northward of it. In bad weather there are heavy breakers between these two shoals, and vessels should at such times pass northward of the latter. Thence pass northward of Sörnygrund, and thence between Mickelsgrund and Jonkrevet.

Ice usually obstructs navigation in Mo Harbor from the last of December to the last of April.

Water level.—Ordinary low water, which is about 2 feet below mean water level, is caused by northerly winds of long duration. See section 1-36.

Channels—Depths.—Vessels with a draft of 13 feet can use the southern approach (sec. 9A-10). This channel, however, becomes rather narrow near the harbor entrance. The northern approach, which is available to vessels with a draft of about 10 feet, leads northward of Logaren and around the northern end of Norrbyskar, thence southward through Kalmarsund, the passage between Kalmarn and Norrbyskär and the islands to the westward.

Navigational aids.—Range lights for the southern approach channel are shown on Fästmön, a rock located about $1\frac{1}{4}$ miles westward of the southern tip of Norrbyskär, and on the mainland about $1\frac{1}{2}$ miles northward of Fästmön.

A pair of beacons in range $193\frac{1}{2}^{\circ}$ is located in Lilla Philhällan, and another pair of beacons in range 079° is located on Stora Philhällan about $1\frac{2}{3}$ and 2 miles southeastward, respectively, of Fästmön.

A pair of beacons in range $212\frac{1}{2}^{\circ}$ is located on Västerskaret, a little over 2 miles south-southeastward of Fästmön.

A light is shown on Mehällan, an islet about $\frac{3}{4}$ mile southwestward of the southern end of Norrbyskär.

A light is shown on Bedragarn, an islet located in Mo Harbor in a position about 1 mile northeastward of Fästmön. A light is shown on a ferry slip at Norrbyn, on the mainland about $\frac{3}{4}$ mile farther northwestward.

Two lights in range $249\frac{1}{2}^{\circ}$ are shown on Blågrund and Kvislan, two islets lying close southward of Norrbyskär. This range leads clear of Jonkgrund.

Two pole beacons, surmounted by top marks and occasionally lighted, in range 265° stand on Reveln, an islet located close northward of Norrbyskär.



SOUTHERN APPROACH TO MO HARBOR

From Swedish Sailing Directions

Two white cairn beacons in range 041° are located in the harbor. The front beacon stands on Stugsten, a small rock located $\frac{1}{2}$ mile north-northwestward of Norrbyskär Light; the rear beacon stands on Kalmarn, an islet located $\frac{1}{2}$ mile northeastward of the front beacon.

Buoys mark some of the dangers near the approach and entrance channels.

Anchorage can be taken in Mo Harbor in depths of 2 to 7 fathoms, stone, clay, and mud, about $\frac{1}{4}$ mile south-southeastward of the light structure on Bedragarn.

Pilots can be obtained from Skagsudde (sec. 7E-12) if coming from southward, or Bredskar (sec. 9A-20) if coming from northward. Neither entrance channel should be attempted without a pilot.

9A-10 Directions for Mo Harbor.—Southern entrance:

Vessels approaching the southern entrance steer with the light structures on Fästmön and on the mainland to the northward in range 006°. This track passes close westward of Königsgrund and eastward of Grisselgrund and Svarthällan and thence between several shoals marked by buoys. Remain on this track until in the vicinity of Fästmön. Thence pass westward of Fästmön and, keeping the two cairn beacons in range 041°, pass between Mehällan, an islet on the western side of the harbor about $\frac{3}{4}$ mile westward of the quay at Mo, and a spar buoy close westward of Mehällan; when about $\frac{1}{4}$ mile past the latter buoy, alter course eastward for the anchorage.

Northern entrance: Steer for the beacon on Logaren on a heading between 287° and 326°, or 240° and 243°; pass northeastward of the beacon and when Hörnefors entrance channel light structures are in range 304 $\frac{1}{2}$ °, steer on this heading; when the beacons on Reveln are in range 265°, steer for them, passing southward of a 2 $\frac{3}{4}$ -fathom shoal, marked by a spar buoy and located about 1 $\frac{1}{2}$ miles westward of Vapplan; when about 300 yards from the front beacon of the Reveln

range, alter course to the southward and be guided by the buoys and beacons.

Mo is a village and loading place situated on the western side of Norrbyskär. It has a customs station. Two quays are available. One quay is 174 feet long and has a depth of 12 feet alongside; the other, the coaling quay, is 197 feet long and has a depth of 16 $\frac{1}{2}$ feet alongside. Provisions and water are procurable. A small marine railway and a machine shop are located here. A tug is available. Regular steamer communication is maintained with Stockholm and other coastal ports. See section 1-6.

HÖRNEFORS

9A-11 Hörnefors (63°37' N., 19°54' E.) is a loading place located in Västerfjärden, an inlet indenting the mainland about 3 miles north-northeastward of Mo Harbor. A conspicuous yellow chimney and a tower stand on the eastern side of the harbor. Hörnefors has a customs station.

Anchorage is available in the outer road near Rönnskär in a depth of 26 feet, clay and mud.

Steamer quay, on the eastern side of the inner harbor and immediately north of a pulp warehouse, is 453 feet long and has depths of 14 $\frac{3}{4}$ to 23 $\frac{1}{2}$ feet alongside. A 3-ton crane is available. Usually, however, cargo is worked using ship's gear. North and south of steamer quay, there is an aggregate of about 430 feet of quayage with 6 $\frac{1}{2}$ to 9 $\frac{1}{4}$ feet alongside for the use of lighters. A 1 $\frac{1}{2}$ -ton crane for bulk loading is available.

Except under special conditions, vessels are forbidden to moor to the Pump House Quay in the southern part of the harbor.

Small quantities of provisions are procurable. A local machine shop can effect minor repairs. A tug boat is available and a small marine railway is located in the port. Regular steamer communication is maintained

with Stockholm and other coastal ports. See section 1-6.

Ice usually obstructs the harbor from the middle of December until May.

Depths.—A draft of 24 feet can be taken through the southeastern approach as far as the outer anchorage. Vessels with a draft of about 21 feet can proceed northward to the inner harbor; those with a draft of 17 feet can go alongside the steamer quay.

Southeasterly winds raise the level of the water and northwesterly winds lower it.

Navigational aids.—Range lights for the outer reach of the entrance channel are shown on the mainland southwestward of Hörnefors. A pair of range lights at the head of Västerfjärden and two other pairs of range lights on the eastern side of the harbor mark the harbor channels. The entrance is also marked by spar buoys.

Pilots for Hörnefors can be obtained from Bredskär (sec. 9A-20) by vessels approaching from the northeastward and from Skagsudde (sec. 7E-12), by vessels approaching from the southwestward. Vessels leaving the harbor obtain them from Jarnashamn. Entrance into this small harbor should not be attempted without a pilot.

Directions for Hornefors Harbor.—Approach the beacon on Logaren on a course between 287° and 326°, or 240° and 243°. Pass 1/2 mile northeastward of Logaren and bring the Hornefors entrance channel light structures in range 304 1/2°. Steer on this range for about 4 miles passing northward of Baljan, a ledge usually above water located about 1 1/2 miles east-northeastward of the front light of the Reveln range and marked by a cairn fitted with a radar reflector, and thence between Torrmulen and a buoy to the northward. Torrmulen is an islet located about 800 yards northwestward of Baljan. When close northward of Ronnskar, the islet located next westward of Torrmulen, bring the light structures at the head of the harbor in range 002° and steer for them. When the light beacons at Hornefors come in range

047°, alter course to this heading and proceed to the inner harbor.

9A-12 The coast from Blågrundsudde to Bredskärssund, the southwestern channel leading to Österfjärden, continues northward for about 3¾ miles, forming the western side of Mjölefjärden, thence irregularly eastward for about 6¼ miles to the entrance of Västerfjärden, and thence eastward for an additional 2 miles.

Umeälv, the principal river discharging along this part of the coast, is divided at its mouth into Österfjärden and Västerfjärden by Obbolaö, an island 5¾ miles long and up to 2¼ miles wide. These fjords are encumbered by numerous islets, rocks, and shoals. Österfjärden, the eastern fjord, affords the only channel through which Umeälv is navigable as far as Umeå.

Simphamn, a small harbor and loading place on the western side of Västerfjärden about 1/2 mile from its entrance, has a quay with a depth of 11½ feet at its outer end. A draft of 13½ feet can be taken up to the harbor. Several dangers lie near the approach channel, which is marked by two beacons in range 001°, located northward of the harbor. Anchorage can be taken in Simphamn in a depth of 2 fathoms, mud.

The outermost dangers between Vapplan and Bredskärssund, lying inside of those already described in section 9A-3, are next described.

Utsten, a 4¾-fathom patch, lies about 2 miles east-northeastward of Vapplan.

Vakan, a 3¾-fathom shoal, lies about 7½ miles southeastward of Vapplan. A 5-fathom shoal lies 1/2 mile southward of Vakan.

Alfhildsgrund, a shoal with a least depth of 3½ fathoms and marked on its eastern side by a spar buoy, lies on the western side of the southern approach to Bredskärssund in a position about 1 mile north-northeast-

ward of Vakan and 7 miles southward of Bredskär (sec. 9A-20). A $5\frac{1}{2}$ -fathom shoal lies about $\frac{1}{4}$ mile eastward of Alfildsgrund; a similar shoal lies about $\frac{1}{2}$ mile southeastward of Alfildsgrund.

Sifgrund, a 3-fathom shoal marked by a spar buoy, lies in the southern approach to Västerfjärden in a position about $5\frac{1}{4}$ miles south-southwestward of Bredskär; a $4\frac{1}{2}$ -fathom patch lies about 700 yards northeastward of this shoal.

Svarten, an above-water rock, lies on the western side of the fairway in a position about 2 miles south-southwestward of Västerfjärden entrance.

Purrutsgrund, a $1\frac{1}{2}$ -fathom shoal marked by a spar buoy, lies on the eastern side of the fairway $\frac{9}{10}$ mile eastward of Svarten.

Kryssgrund, a $3\frac{1}{2}$ -fathom patch marked by a spar buoy, lies in the southern approach to Bredskärssund in a position nearly $4\frac{3}{4}$ miles southward of Bredskär.

Hampusgrund, a $1\frac{1}{4}$ -fathom shoal marked by a spar buoy, lies on the eastern side of the fairway in a position about $4\frac{1}{4}$ miles southward of Bredskär. Many other unmarked shoals lie on the eastern side of the southern approach to Bredskärssund both southward and northward of Hampusgrund; a $5\frac{1}{4}$ -fathom shoal lies on the western side in a position about 3 miles southward of Bredskär.

Väspan, a shoal with a depth of $3\frac{1}{2}$ fathoms, lies on the western side of the fairway in a position about $2\frac{3}{4}$ miles southward of Bredskär.

Stygnet, a 3-fathom shoal marked on its western side by a spar buoy, lies in the fairway about $\frac{1}{4}$ mile east-northeastward of Väspan. Bocken, with a depth of $2\frac{3}{4}$ fathoms, lies $\frac{1}{2}$ mile eastward of Stygnet.

Many other dangers, lying within 2 miles southward of Obbolaö and Bredskär, are not described; buoys mark most of those lying

in or near the fairways of the channels leading northward to Västerfjärden and Bredskärssund.

UMEÅ AND APPROACHES

GENERAL REMARKS

9A-13 The port of Umeå has two harbors. The river harbor is located at the town, about 10 miles northward of Österfjärden entrance. Holmsund, the outport of Umeå, is located on the eastern side of Österfjärden about 7 miles southward of the town.

Djupvik and Sandvik are loading places located close northward of Holmsund. Obbola is a loading place on the eastern side of the island of Obbolaö.

Three entrance channels, leading from eastward, southeastward and southwestward, join to form one channel, which continues in a general northerly direction through the length of Österfjärden and the lower 4 miles of Umeälv to the river harbor at Umeå. All channels are well marked by aids.

Deep-draft vessels use the facilities at Holmsund and at the loading places nearby. Depths in the river harbor limit its use to small vessels and lighters.

NAVIGATION

9A-14 From a position about $1\frac{1}{2}$ miles southeastward of Sydostbrotten Light (sec. 7E-6), a course of 040° for $14\frac{1}{2}$ miles leads over a least charted depth of $7\frac{1}{2}$ fathoms to a position on the main channel approach track $11\frac{1}{4}$ miles south-southeastward of Fjärdgrund Light (sec. 9A-20); thence a course of 332° , heading for Fjärdgrund Light, for $7\frac{1}{4}$ miles leads over a least charted depth of $6\frac{1}{2}$ fathoms to a position about $\frac{1}{4}$ mile southward of the light marking Vaktaren (sec. 9A-21), where pilots meet vessels. Greater

depths are available on either side of these tracks.

Vessels proceeding eastward from Järnäs-hamn on the inshore track described in section 9A-9 may, from a position $\frac{1}{2}$ mile northward of Bonden, steer a course of 070° for 12 miles to a position about 1 mile southward of the lighted whistle buoy marking Veg-agrund (sec. 9A-4), thence a course of 009° for 8 miles to the main channel approach track, thence a course of 332° for $3\frac{1}{4}$ miles to the pilot station mentioned above. The charted depth on this track is 7 fathoms.

ICE

9A-15 The outer harbors are usually closed by ice from the end of January to the beginning of May; the river harbor is usually closed from the middle of November to the beginning of May.

WATER LEVEL

9A-16 There is a range of about 2 feet between mean and ordinary low water. Strong southerly and southeasterly winds cause high water, and northerly and northwesterly winds cause low water. The greatest range occurs in the spring and fall. See section 1-36.

CURRENT

9A-17 In the channels leading to Umeå and the outer harbors the current is always outgoing; at times it attains a velocity of 4 to 5 knots. Caution is always necessary when navigating these channels.

DEPTHS

9A-18 Vessels with a draft of 13 feet can be taken through Bredskärssund. A draft of 33 feet can be taken through the main channel entrance eastward of Bredskär and vessels with a draft of 27 feet can proceed through the lower part of Österfjärden to the anchorages of Obbola and Holmsund. A draft of 14 feet can be taken through the eastern approach

channel which leads northward of Petland-skär.

The least depth in the channel leading to Umeå is $9\frac{3}{4}$ feet; the depth alongside the quay here is $10\frac{1}{4}$ feet.

Depths in the anchorages at the loading places are: Holmsund (between Holmsund and Obbola), 36 to 56 feet; Obbola, 33 to 42 feet; Djupvik, $19\frac{1}{2}$ feet; Sandvik, $19\frac{1}{2}$ feet.

Depths alongside the berths at the loading places vary from 8 to $29\frac{1}{2}$ feet.

LANDMARKS

9A-19 Conspicuous landmarks in the approaches to Umeå include: the chimneys of the sawmill at Obbola; Holmsund church, which is painted white, has a black spire, and stands about $2\frac{1}{2}$ miles north-northeastward of the northern end of Bredskär; a water tower with an elevation of 180 feet, about $\frac{1}{4}$ mile east-northeastward of Holmsund Church; the chimneys of the sawmills at Holmsund and Sandvik; the lookout towers at Sandvik and Djupvik; Djäknebölsklinten, a wooded, 440-foot hill with three crests located about $1\frac{1}{2}$ miles southwestward of Umeå. There is a light on the water tower.

CHANNELS—ISLANDS AND DANGERS IN THE APPROACHES

9A-20 Bredskärssund ($63^\circ 40' N.$, $20^\circ 19' E.$), the sound lying between the southeastern side of Obbolaö and the small island of Bredskär, is the southwestern entrance channel. At its narrowest part it is about 200 yards wide, but shoals extending from Obbolaö reduce the navigable width. Two approach channels lead into this sound. The main approach leads northward from the pilot station (sec. 9A-22) near Väsplan and Stygnet and is available to vessels with a draft of 13 feet. The other channel, with a least depth of 10 feet, leads from a position on the Simphamn approach range about $2\frac{1}{4}$

miles southwestward of Bredskärssund entrance. Both approach channels are buoyed.

Obbolsten, lying nearly $\frac{3}{4}$ mile south-southwestward of Bredskär, is a high rock surrounded by smaller above-water rocks; this group of rocks lies on a reef extending about $\frac{3}{4}$ mile southward from Obbolaö.

Two lights in range 000°, marking the southern approach to Bredskärssund, are shown on the southeastern shore of Obbolaö westward of Bredskär.

Bredskär is a moderately high island about $\frac{2}{3}$ mile long, northeast and southwest, and is mostly bare. Pilots are stationed on the island, but board vessels in the different entrance channels, as indicated in section 9A-22. Foul ground, on which the rocky islet of Bredskärssten lies, extends about 1,200 yards southward from Bredskär. A spar buoy marks the southern end of this foul ground.

Range lights, marking a reach of the main channel leading into Österfjärden, are shown on the northeastern side of Bredskär. Two beacons in range 002½° stand on the southwestern side of the island. Another beacon stands on the eastern side of the island close southwestward of the front range light. A radar reflector stands close northward of the front range light.

Anchorage.—Anchorage can be taken in the northern part of Bredskärssund or northward of Bredskär in depths of from 8 to 10 fathoms, clay.

Storbådan and **Lillbådan** are rocks lying $1\frac{1}{2}$ miles and $\frac{3}{4}$ mile southeastward of Bredskär. Reefs surround both rocks; that extending northeastward from Storbådan is marked by a spar buoy. A light with a radar reflector is located on Storbådan. A 2-fathom patch, marked by a spar buoy, lies about $\frac{1}{4}$ mile southeastward of the light.

A 2-fathom shoal, marked on its southern side by a spar buoy, lies about 650 yards southward of Lillbådan.

Fjärdgrund Light stands on a rock of the same name located in the southern part of Österfjärden about $\frac{1}{2}$ mile northeastward of Bredskar. Foul ground surrounds the rock and extends nearly $\frac{1}{4}$ mile eastward from it.

9A-21 The main, or southeastern, entrance channel leads eastward of Storbådan, Lillbådan, and Bredskär and westward of the group of shoals extending southward from Petlandskär.

Emanuelsggrund, a 1 1/2-fathom shoal lies on the western side of the main channel approach fairway in a position about 5 3/4 miles south-southeastward of Bredskar. A 4 3/4-fathom patch and a 4 1/4-fathom patch lie 1 1/4 miles east-southeastward and 1 3/4 miles southeastward, respectively, of Emanuelsggrund. A 4 1/2-fathom patch lies about 7 miles south-southeastward of Bredskar. Numerous shoals, some of which are marked by spar buoys, lie between Emanuelsggrund and Bredskar.

Väktaren, with a depth of 4 1/4 fathoms and marked on its southern side by a light with a radar beacon, lies on the northeastern side of the fairway about 4 miles southeastward of Fjärdgrund Light. Numerous dangers lie between Vaktaren and Petlandskar, to the northward.

Majesticgrund, a 1 1/2-fathom shoal marked on its eastern side by a spar buoy, lies on the southwestern side of the fairway 3 miles south-southeastward of Fjärdgrund Light.

Långan, a 1 3/4-fathom shoal, lies close southeastward of the previously described Lillbådan. **Klinten**, a 2 1/4-fathom shoal marked by a spar buoy, lies on the northeastern side of the fairway about 600 yards northeastward of Lillbådan.

Revet, a shoal with a least depth of 4 feet and about $\frac{1}{2}$ mile long, north and south, lies on the northeastern side of the fairway with a cairn standing on its southern extremity, about 3/4 mile southward of Fjärdgrund Light.

Petlandskär is a small low rock located about $1\frac{3}{4}$ miles eastward of Bredskär. Three lights, which form two ranges, are shown from structures on the northern end of the rock. Numerous rocks and shoals lie within $1\frac{1}{2}$ miles eastward and $2\frac{1}{2}$ miles southward of Petlandskär.

The eastern entrance channel leads westward toward Petlandskär, thence northward

of that rock and between Revet and Fjärdgrund. Desterrogrund, lying about $3\frac{3}{4}$ miles east-northeastward of Petlandskär, is described in section 9A-4.

Trehövda, a shoal with a least depth of $3\frac{1}{2}$ fathoms, lies in the fairway of the eastern approach in a position about $\frac{1}{2}$ mile southward of Desterrogrund and nearly 4 miles eastward of Petlandskär.

Jacobsgrund, a $3\frac{3}{4}$ -fathom shoal marked on its northern side by a **spar buoy**, lies on the southern side of the fairway $1\frac{1}{4}$ miles eastward of Petlandskär.

Isaksgrund, a $2\frac{1}{4}$ -fathom shoal marked on its southern side by a **spar buoy**, lies on the northern side of the fairway about $\frac{1}{4}$ mile northwestward of Jacobsgrund.

A $1\frac{1}{2}$ -fathom patch, marked by a **spar buoy**, lies on the northern side of the fairway about 800 yards east-northeastward of Petlandskär.

Saragrund, a 2-fathom patch marked by a **spar buoy**, lies on the northern side of the fairway about $\frac{1}{8}$ mile northeastward of the northern end of Petlandskär. A **spar buoy** marks the northern end of the foul ground extending from Petlandskär.

Evagrund, a $2\frac{3}{4}$ -fathom patch lies on the southern side of the fairway about 800 yards west-northwestward of Petlandskär.

Åhällan is a rock lying on the northern side of the fairway about $\frac{1}{2}$ mile northwestward of Petlandskär. Several other above-water rocks lie on a reef extending nearly $\frac{1}{8}$ mile southward from Åhällan. A **spar buoy** marks the southern end of these dangers. Other unmarked rocks and shoals lie near the fairway.

Several islands, islets, and shoals lie on either side of the channel leading from the channel junction position $\frac{1}{4}$ mile westward of Fjärdgrund (sec. 9A-13) to Holmsund. **Klubbarne**, consisting of two islets, and **Klubbgrund** lie on the western side of the fairway; **Lilla Truthällan**, **Stora Trut-**

hällan, **Hillskär**, and **Stormskär** lie on the eastern side. **Spar buoys** mark the southern and eastern edges of **Klubbgrund**, the eastern and northeastern edges of a shoal extending from **Klubbarne** toward the channel fairway, and a 3-fathom patch lying on the eastern side of the fairway abreast **Stora Truthällan**. **Spar buoys** also mark the dangers near the channels leading into **Holmsund**. Two **lights** in range 335° , shown on **Hillskar**, mark the channel from seaward to the entrance of the **Bredskar** range.

Caution.—A defensive area is located in the area bounded on the north by a line joining the northern extremity of **Hillskär** and the northern end of **Klubbgrund**, and on the south by a line joining the southern extremity of **Stora Truthällan** and the northern extremity of the southern of the **Klubbarne** islets. Surface navigation is permitted but anchorage and fishing are prohibited due to the possible presence of bottom mines. Passage through the area during thunderstorms may be dangerous.

Submarine Cables.—A submarine cable (sec. 1-34) is laid between the western side of **Bredskar** and **Fjärdgrund**. A pair of **lights** in range 058° stand on **Fjärdgrund** and indicate the direction of this cable. Several other submarine cables are laid between **Holmsund** and **Obbolaon**, and from either side of **Stor-sandskar**, about 3 miles southward of **Umea**.

A high tension power cable extends in a south-southeasterly direction from **Hillskar Light** to **Vaktaren Light**.

PILOTS

9A-22 Pilots are stationed on **Bredskär** and meet vessels near the entrances of the three channels as follows: southwestern channel, in the vicinity of **Väspan** and **Stygnen** about $2\frac{1}{2}$ miles southward of **Bredskär**; southeastern or main channel, close southward of **Väktaren** about 4 miles southeastward of **Bredskär**; eastern channel, in the vicinity of **Isaksgrund** and **Jacobsgrund** about 3 miles eastward of **Bredskär**. See section 1-25. The pilot station is equipped with radar and radiotelephone.

DIRECTIONS FOR ENTERING

9A-23 Vessels approaching the main entrance channel should steer for the range lights, located on Hillskar, bearing 335° , this range leads northeastward of Vega-grund and Emanuelsgrund, thence south-westward of Väktaren, thence northeastward of Majesticgrund. When Bredskär range lights structures are in range 318° , steer for them, passing northeastward of Storbådan and Lillbådan, thence south-westward of Klinten and the spar buoy marking the southern end of Revet. After passing this buoy and when about 800 yards from the front light of the Bredskär range, alter course to 346° passing eastward of a spar buoy marking the eastern edge of the reef extending from the southeastern side of Bredskär. When Fjärdgrund Light is abeam, steer for Långhalsudde Light (sec. 9A-24) bearing 356° , passing eastward of the spar buoys moored eastward and northeastward of Klubbarne and eastward of Klubbgrund, and westward of a spar buoy marking the 3-fathom patch abreast Stora Truthällan.

Vessels proceeding to Holmsund, Djupvik, or Sandvik should, when about 800 yards southward of Långhalsudde Light, bring the range light structures at Holmsund (sec. 9A-25) in range 034° , which lead to the berths at Holmsund. The channel leading northward from this harbor is marked by buoys and by

two lights in range 007° , located on the south-eastern side of Holmen (sec. 9A-26).

Vessels proceeding to Obbola should, when about 700 yards southward of Långhalsudde Light, alter course north-northeastward, which leads to that harbor.

Vessels proceeding to Umeå should, from a position off Obbola, bring the range light structures on Tuvan (sec. 9A-27) in range 347° , which lead through the relatively deep part of Österfjärden to a position within $\frac{1}{2}$ mile of the front light structure, where the channel narrows and is marked by buoys. For the remaining distance of approximately 5 miles follow the channel as indicated by range lights and buoys.

Directions for the more intricate south-western and eastern entrance channels are not given. A pilot should be employed when entering Umeå, Holmsund, or any of the nearby loading places.

9A-24 A light is shown occasionally from the head of each of two small breakwaters, which protect the fishing boat harbors located at the village of Obbolaby on the northern side of a cove about $1\frac{1}{2}$ miles north-northwestward of Bredskär.

Långhalsudde Light is shown on the eastern side of Obbolaö in a position about 2 miles northward of Bredskär.

OBbola

Position: 63°42' N., 20°20' E.
Depths: Channel to the outer anchorage, 27-foot draft.
 Outer anchorage, 33 to 42 feet.
 Harbor anchorage, 24 feet.
 Quays, 9¾ to 20 feet.
 Dolphin berths, 26 feet.
Tidal rise: Negligible.
Port plan: See section 9A-26.

9A-25 Obbola is a loading place on the eastern side of Obbolaö about 2¼ miles northward of Bredskär.

Harbor.—A breakwater, extending north-eastward from the shore, thence northward to a narrow islet, protects the harbor. The principal berths are located close northward and southward of this harbor area. Dolphins are located inside the breakwater.

Lighted range beacons, marking submarine cables (sec. 1-34) between Obolla and Holmsund, stand close northward of the harbor area.

Two beacons, marking a pipeline between Obolla and Holmsund, stand on the northern end of the islet fronting the harbor area. Warning boards mark each end of the pipeline.

Anchorage can be taken in the outer roadstead, just eastward of the harbor, in depths of 33 to 42 feet. Vessels can also anchor inside the breakwater in a depth of 24 feet. The bottom is mud and ooze.

Facilities.—The harbor facilities at Obbola serve the pulp and lumber industries which are located in the vicinity. Vessels with drafts exceeding 19½ feet transfer cargo at the anchorages.

Kolkajen is about 295 feet long and has depths of 6½ to 19½ feet alongside. **Langkajen**, about 354 feet long, has a depth of 23½ feet alongside its outer part shoaling to a depth of 6 feet at its inner end. **Massakajen**, about 288 feet long, has depths of 14 to 25 feet alongside its southern side and 17 to 25 feet alongside its northern side. The dolphin berths inside the breakwater harbor have a depth of 26 feet. **Angbåtskajen** is about 492 feet long and has depths of 7½ to 13 feet alongside. There is a crane with a capacity of 15 tons per hour in the harbor. A tug is available.

Provisions and water are procurable. Minor repairs can be effected. Regular steamer communication is maintained with Stockholm and other coastal ports. See section 1-6.

Range lights, which lead to the southern quay at Holmsund, are located on the mainland side of Österfjärden about ½ mile northeastward of Långhalsudde Light.

HOLMSUND

Position: 63°42' N., 20°21' E.
Depths: Channel to the anchorage, 27-foot draft.
 Quays, 16 to 26 feet.
 Stormskär, 33 feet.
 Anchorage, 36 to 56 feet.
Tidal rise: Negligible.
Port plan: See section 9A-26.

9A-26 Holmsund (Umeå Uthamn), the outport of Umeå, lies on the eastern side of Österfjärden opposite Obbola and about 2½ miles north-northeastward of Bredskär. The principal harbor facilities in Österfjärden are located here.

Harbor.—The harbor area lies between the mainland, which extends northward for about ½ mile, and a narrow shoal, with a least depth of 1¼ fathoms, extending southward from Holmen. Spar buoys mark the shoal.

Holmen, a narrow island nearly ¾ mile long, north and south, lies close northward of the harbor. **Range lights** for the channel leading northward through the harbor are shown on the southern end of Holmen.

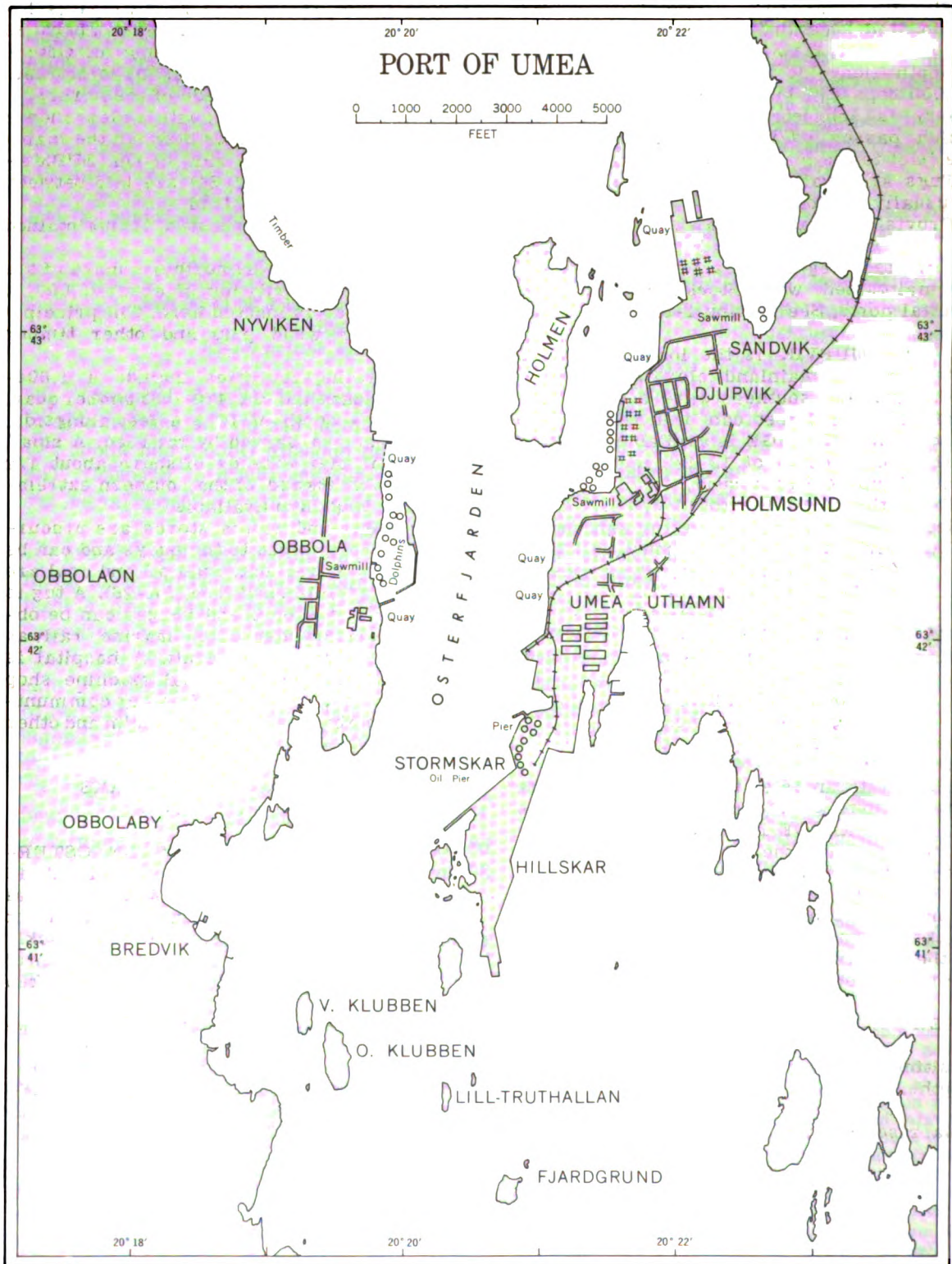
Anchorage can be taken in the roadstead between Holmsund and Obbola in depths of 36 to 56 feet, clay and mud.

Holmsund, a town with a population of about 4,000, extends eastward and northeastward from its harbor.

Harbor works were in progress in 1959 to build additional piers, deepen the harbor, and provide more extensive cargo facilities.

The southern of the two principal quays is 1,115 feet long and is of concrete and timber construction. The concrete section is 426 feet long and has a depth of 26 feet alongside; the timber section is 689 feet long and has a depth of 18¾ feet alongside. This quay is connected to the railroad system, which serves Umeå. Two cranes, with capacities of 5 and 7½ tons, are located on the quay.

The other quay has a berthing length of about 1,650 feet with a depth of 16 feet alongside.



The oil installation for the Port of Umea is located on Stormskar and consists of a refinery, tank farm, and a 280-foot pier with a depth alongside of 36 feet. Vessels up to 24,000 tons can be accommodated. The refinery is connected to the railway system which passes over a filled in area joining the islet to the mainland northward.

Tugs are available, and a salvage vessel is usually stationed here.

Provisions, water, ship's stores, coal, and fuel oil are procurable. Minor repairs can be effected. Regular steamer communication is maintained with Stockholm and other coastal ports. See section 1-6.

9A-27 DJUPVIK is the loading place located on the mainland close northward of Holmsund and southeastward of Holmen. A draft of 19 1/2 feet can be taken up to the harbor. ANCHORAGE is available inside the harbor in a depth of 19 1/2 feet, mud and ooze. Djupvik has a quay, 1,099 feet long, with depths of 10 1/2 to 14 3/4 feet alongside.

SANDVIK, located close northward of Djupvik, has about 785 feet of quayage with depths alongside the north-south section of 8 1/4 to 18 feet and alongside the east-west section of 19 1/2 to 29 1/2 feet. ANCHORAGE can be taken off Sandvik in a depth of 19 1/2 feet, mud and ooze.

QUARANTINE ANCHORAGE.—The quarantine anchorage for the Umea district is located in Osterfjarden close off the northern end of Holmen.

TUVAN is an islet in the northern part of Osterfjarden where the Umealv flows into that fjord. RANGE LIGHTS for the approach channel through the fjord (sec. 9A-23) are shown on the eastern side of the islet.

THE RIVER CHANNEL LEADING TO UMEA is narrow, subject to silting, but is well marked by range lights and buoys. Anchoring in the several reaches of the river channel is prohibited.

UMEA

Position: 63°49' N., 20°17' E.
 Depths: River channel, 9 3/4 feet.
 Quays, 10 3/4 feet.
 Tidal rise: Negligible.

9A-28 The river harbor of Umea is located at a turn in the Umealv about 10 miles northward of the entrance of Osterfjarden. The island On lies in midstream and forms the southern side of the harbor.

An ELECTRIC CABLE, with a clearance of 111 feet, spans the river between the mainland and the eastern side of On. SUBMARINE CABLES (sec. 1-34) are laid between the mainland and the island.

A line-throwing apparatus is maintained at Umea.

UMEA, a town on the northern shore of the harbor, has a population of about 23,000. A customs office is located here. The principal exports are wood pulp and other timber products.

The berthing facilities include a 1,804-foot stone quay and a 1,476-foot timber quay, each with a depth of 10 3/4 feet alongside. The berths are served by railroad. A small T-head oil pier extends offshore about 1/2 mile southeastward of the southern extremity of On. Tugs are available.

Provisions and ship's stores are procurable. Water is piped to the quays and can be supplied by waterboat. Fuel oil and coal are available at Holmsund (sec. 9A-26). A tug is stationed in the port and barges can be obtained from Holmsund. A marine railway is available for small craft. A hospital is located in the town. A local machine shop can make minor repairs. Steamer communication is maintained with Stockholm and other coastal ports. See section 1-6.

COASTAL FEATURES—LANDMARKS (Northeastward of Osterfjarden)

9A-29 THE COAST BETWEEN OSTERFJARDEN AND NORRFJARDEN, about 15 miles northeastward, is indented by several other fjords and forms the western shore of Vastra Kvarken. It is mostly low and thickly wooded. Dangers extending off this stretch of coast to the western side of Vastra Kvarken are described in section 9A-4.

TAFTELANDET is the irregularly shaped peninsula separating Yttre Taftfjarden, to the westward, from Safvarfjarden, to the eastward. A pair of FISHING RANGE LIGHTS is shown on Rofagern, one of the several islets close off the southwestern side of the peninsula.

BJUREN is an islet lying about 800 yards off the eastern side of Taftelandet in the southwestern part of Safvarfjorden. **ANCHORAGE** can be taken by small vessels between Bjuren and Taftelandet in a depth of 2 1/2 fathoms, mud. Local knowledge is required for the narrow and intricate entrance channel, which can be used by vessels with a draft of 13 feet. Several pairs of **BEACONS** mark the channel.

SKEPPARKALLEN, a 9-foot high rock marked by a **CAIRN BEACON**, lies about 1 mile offshore and about 3 1/2 miles north-eastward of Bjuren.

Two pairs of **LIGHT BEACONS** in range 284° and 318° are shown in Norrfjorden and lead to the inner recesses of this fjord. The entrance range (284°) leads from a position about 1 1/2 miles east-southeastward of the fjord, and the dangers adjacent to the channel are marked by **SPAR BUOYS**.

9A-30 THE COAST BETWEEN NORRFJARDEN AND RATAN trends generally north-northeastward for about 8 1/4 miles. Nyhamnsfjord recedes northward for about 1 mile about midway along this coast.

KARINGSKAR and **KARINGBADAN** are two high, nearly bare, reef-fringed islets lying about 1 mile eastward and 1 3/4 miles east-northeastward, respectively, of the southern entrance point of Nyhamnsfjord. A small boat harbor is located on the western side of Karingskar. Amiralen, Agrund, and Buskgrund, the outermost of the dangers lying near these islets, are described in section 9A-4.

BREDNORET (63° 56' N., 20° 48' E.) is a loading place on the western side of Nyhamnsfjord.

ANCHORAGE can be taken in Nyhamnsfjord westward of Farskar, an islet 1 1/2 miles northwestward of Karingbadan, in a depth of 19 1/2 feet, sand and clay. Smaller vessels can anchor farther northward in a depth of 13 feet. Two **CHANNELS**, available to vessels with a draft of 16 1/2 feet, lead to the outer anchorage. One channel leads westward of Karingskar, and the other leads northward of Karingbadan. Numerous dangers lie in the approaches. **PILOTS** are available at

Bredskar and Gasoren (sec. 10B-21); the use of a pilot is recommended. Two **BEACONS** in range 265°, leading through the northern approach channel, are located on the mainland westward of Karingbadan. **ICE** usually obstructs navigation in Nyhamnsfjord from December to the middle of May.

ANCHORAGES

9A-31 JARNASHAMN.—See section 9A-7.
OREFJARDEN—OFF KYLOREN.—See section 9A-8.

MO HARBOR.—See section 9A-9.

HORNEFORS.—See section 9A-11.

SIMPHAMN.—See section 9A-12.

BREDSKARSSUND.—See section 9A-20.

BREDVIK.—See section 9A-24.

OBOLA.—See section 9A-25.

HOLMSUND.—See section 9A-26.

DJUPVIK.—See section 9A-27.

SANDVIK.—See section 9A-27.

WESTWARD OF BJUREN.—See section 9A-29.

NYHAMNSFJARD.—See section 9A-30.

PART B. COAST OF FINLAND—NORRA KALLAN TO HALLGRUND

9B-1 NORRA KALLAN (62° 59' N., 20° 45' E.) is a rocky islet which lies near the outer edge of the dangers extending about 25 miles west-southwestward from the port of Vaasa. This small islet lies near the northwestern edge of a shoal, with a least depth of 9 feet, which extends for about 2 1/4 miles in a general north-south direction and is nearly joined to another shoal, with a least depth of about 8 feet, which extends northward for an additional 1 1/2 miles.

STROMMINGSBADAN LIGHT is shown on Norra Kallan.

STROMMINGSBADAN and **SODERKALLAN** are two above-water rocks which lie on the same shoal as Norra Kallan in positions about 1 mile southward and 1 1/4 miles south-southeastward of that islet. **Vesterhallan**, a 2-fathom rock marked by a spar

buoy, lies 1/2 mile westward of Norra Kallan. Karpoff, a 2.8 m (1 1/2 fms.) patch marked by a spar buoy, lies about 1 3/4 miles south-southwestward of Norra Kallan.

COAST—GENERAL

9B-2 The Finnish coast, from a point on the mainland 15 1/2 miles southeastward of Norra Kallan, trends very irregularly north-northeastward for about 60 miles to a mainland point about 2 1/2 miles eastward of Hällgrund, an islet on the western side of the approach to Uusikaarlepyy. Fjords, bays, and coves indent this entire stretch of coast. Hundreds of islands, islets, rocks, and other dangers encumber these inlets, fringe the coast, and extend outward to a distance of about 30 miles offshore. Several large areas that have not been surveyed are located among the islands. The outermost dangers form the southeastern side of Östra Kvarken, the eastern part of Norra Kvarken.

Most of the outer dangers, islands, and islets fronting this coast are near one or more of the several channels leading to the port of Vaasa. Included among these are the following island and islet groups: Rönnskären, which is centered about 6 1/2 miles northward of Norra Kallan; Norrskären, which is the westernmost group and is centered about 15 miles north-northwestward of Norra Kallan; Valassaaret, which lies up to 27 miles northwestward of Vaasa; Mickelsörar, the easternmost group, which is centered about 20 miles northward of Vaasa and about 22 miles southwestward of Hällgrund. The principal islands lying between the coast and the outer dangers are, from west to east: Halsö, Bredskär, Bergö, Vallgrund, Björkö, Raippaluoto, Lillö, Koklot, Värilaks, Västerö, Österö, Stor Ljusen, Svartör, Stubben, and Torsö.

Landmarks—Caution.—This part of the Finnish coast is low and wooded and lacks good natural landmarks; it appears to pass-

ing vessels to be farther away than it actually is. The navigator approaching this coast must rely exclusively on lighthouses, beacons, and similar aids. The most important aids are Strömmingsbådan Light, Rönnskär Tower, Norrskär Light, Valassaaret Light, Ritgrund Light, and Stubben Light. In thick weather care must be taken to avoid confusing Rönnskär Tower with Norrskär Light-house.

Vaasa is the only place of commercial importance along this coast. Several small loading places are located in the fjords north-eastward of that port.

DEPTHS—OFF-LYING DANGERS

9B-3 Depths among the maze of islands and dangers extending between Norra Kallan and Hällgrund are very irregular. The general depths between Norra Kallan and Sydostbrotten Light (sec. 9A-3), in the southwestern entrance of Norra Kvarken, are 37 to 92 meters (20 to 50 fms.). General depths on the southern side of Norra Kvarken between the dangers near the southern channel of Östra Kvarken (sec. 9C-8) and Hallgrund, and just outside the dangers extending northward from the coast, are 18.3 to 37 meters (10 to 20 fms.); however, a number of detached shoal patches lie in this area.

The least depth on the navigational track between Norra Kallan and Hallgrund (sec. 9B-4), found in the reach that leads through the southern channel of Östra Kvarken, is 6 fathoms. On other parts of this track the least charted depth is 18.4 m (10 fms.). Vessels with a draft of 26 feet can use the main channel leading into the harbor of Vaasa. Other channels leading to the harbor can accommodate vessels with drafts of 10, 18, and 21 feet.

Dangers lying near the channels leading to Vaasa, including those on the outer edge of this area, are described with the sea approaches of Vaasa in section 9B-6.

Helsingkallan (Khelsingkallan), two shoals with a least depth of 2.1 m (1 1/4 fms.) and a depth of 10.9 m (6 fms.) between them, lies up to 13 miles offshore and about 15 1/2 miles westward of Hallgrund. It is the northernmost danger off this part of the coast. The western shoal is marked on its northwestern side by a spar buoy, and the eastern shoal is marked on its northern side by two spar buoys. A lighted whistle buoy equipped with a radar reflector, is moored about 1/3 mile northward of the western shoal.

Numerous charted and uncharted dangers lie between Helsingkallan and the Mickelsor group (sec. 9B-10). They extend westward from a position about 4 1/2 miles northward of Stubben (sec. 9B-21) to a position about 18 miles west-northwestward of Stubben.

An 8.5 m (4 3/4 fms.) shoal lies on the southern side of Norra Kvarken in a position about 9 1/2 miles northeastward of Storskar (sec. 9B-10), an island in the Valasaaret group, and the same distance northwestward of Ritgrund (sec. 9B-10). Depths of 10.3 m (5 3/4 fms.) and 12.0 m (6 1/2 fms.) are charted within 1 mile southward of this shoal. A 12 m (6 1/2 fms.) patch lies about 4 1/2 miles northward of Ritgrund.

Dangers in Ostra Kvarken are described with its channels in section 9C-8.

NAVIGATION

9B-4 From a position 5 miles westward of Norra Kallan (sec. 9B-1), a course of 354° for about 15 miles leads over a least depth of 56 m (30 fms.) to a position 2 3/4 miles westward of Norrskar (sec. 9B-7); thence a course of 017° for 11 1/4 miles leads over a least depth of 18.4 m (10 fms.) to a position off the southern entrance to Ostra Kvarken; this latter course leads close westward of a 14.6 m (8 fms.) shoal lying about 6 1/2 miles northward of Norr-

skar; thence, a course of 043 1/2° for 12 1/2 miles leads through the southern channel of Ostra Kvarken over a least charted depth of 10.9 m (6 fms.) to a position 5 1/2 miles east-southeastward of Holmogadd (sec. 9C-2); thence, a course of 081° for 37 3/4 miles leads over a least depth of 18.4 m (10 fms.) to a position 2 1/2 miles northward of Hallgrund.

CURRENTS

9B-5 General current movements in the Gulf of Bothnia are described in chapter 1. The current in the vicinity of Östra Kvarken is uncertain as to set and velocity; its movement sometimes precedes the wind. Southward of Norrskar, the current usually sets onshore.

APPROACHES TO VAASA

9B-6 General remarks.—Most of the area described in this chapter part comprises the approaches to the port of Vaasa. The several channels leading into its harbor are located, and the principal channels are described, as are the dangers, navigational aids, and other landmarks and features in their vicinity.

Vargögaddarne is a group of islets and rocks which lies about 2 to 4 miles eastward of Norra Kallan and Strömmingsbådan.

Rönnskären, consisting of a group of small, low, barren islets, lies from 20 to 24 miles westward of Vaasa. The islet Rönnskär is located near the eastern edge of the group about 6 1/2 miles north-northeastward of Norra Kallan. Storsanden, one of the larger islets, lies on the western edge about 3 miles westward of Rönnskär. Foul ground, with above- and below-water rocks, extends about 3/4 mile westward and 3 3/4 miles northward from Storsanden. Skvättan, the westernmost islet of

Rönnskären, lies $2\frac{3}{4}$ miles north-northwestward of Storsanden.

Rönnskär Tower ($63^{\circ}04' N., 20^{\circ}48' E.$), a 71-foot high square wooden structure, stands on the islet Fälliskär in a position about $5\frac{1}{4}$ miles north-northeastward of Norra Kallan. A 46-foot high black and white beacon is located close westward of the tower and is in range 070° with the tower. Rönnskär Tower is a good landmark for vessels bound northward or for those approaching the port of Vaasa through Rönnskären Channel.

Rönnskär pilot station is located on Fälliskär near the tower. A line-throwing apparatus is maintained.

Five different approach channels lead toward Vaasa among the many islands, islets, and dangers lying off that port. The main channel, which is available to vessels with a draft of 26 feet, leads into the harbor from the northwestward. A channel authorized for drafts of 18 feet leads in from westward. A channel from the southward can be used by vessels with a draft of 10 feet, and a channel from the northward can be used by vessels with a draft of 16 feet. These channels have a common inner reach, which leads through the harbor to the deep-water facilities of the port; smaller channels branch from this one and lead to the other facilities. Rönnskären Channel, the channel passing southward of Norrskar, and the main channel are the only ones described.

9B-7 Rönnskären Channel—Navigational aids.—Rönnskären Channel, the western approach channel which is suitable for a draft of 21 feet, leads northeastward among the dangers of Rönnskären, thence east-northeastward to its intersection with the main approach channel from the northwestward. The total distance along this approach, including the inner main channel reaches lead-

ing into the outer harbor of Vaasa, is 24 miles. Rönnskär Tower and Rönnskär Beacon in range 070° lead up to Rönnskären Channel entrance, which lies between the buoy-marked shoals Nygrund and Kallremmaren, lying $1\frac{3}{4}$ miles southwestward and $1\frac{3}{4}$ miles west-southwestward, respectively, of Rönnskär Tower. Nygrund has a least depth of 3 feet, and Kallremmaren has a least depth of 6 feet.

Dersiskärsgrund Light is shown on a rock about $\frac{1}{2}$ mile west-southwestward of Rönnskär. Rönnskärsbådan Light is shown on an islet of that name located close westward of Rönnskär. These two lights in range $061\frac{1}{2}^{\circ}$ lead from the channel entrance, between buoy-marked shoals, for a distance of about $1\frac{1}{2}$ miles to the intersection of the Djupskär—Lilla Svartbådan range. A continuation on this $061\frac{1}{2}^{\circ}$ range for an additional $\frac{3}{4}$ mile leads to its intersection with the Tummelsö range, two lights in range 102° , located nearly $\frac{1}{2}$ mile southward of Rönnskär, and leading to the entrance of Rönnskär Harbor. This small harbor, located about $\frac{1}{2}$ mile southeastward of the rock Dersiskärsgrund and close eastward of an islet named Dersiskär, affords protected anchorage to small vessels in a depth of 9.2 m (5 fms.), clay. A draft of 13 feet can be taken up to the harbor.

Djupskär Light is shown on a small islet of the same name located $1\frac{3}{4}$ miles northward of Dersiskärsgrund Light. Lilla Svartbådan Light is shown on an islet about $\frac{3}{4}$ mile farther north-northeastward. These two lights in range 021° lead through the western part of Rönnskären Channel, from the intersection with the $061\frac{1}{2}^{\circ}$ range, for a distance of $1\frac{5}{8}$ miles to a position about midway between the northern end of the islet Låg-bådan, on the west, and the islet Äggbådan, on the east. At this position the channel divides, one part leading southward of Veck-

argrund and the other part leading northward of that islet, which lies about $\frac{1}{2}$ mile northeastward of Äggbådan.

Medelbådan Light is shown on an islet of that name located $3\frac{1}{2}$ miles westward of Lågbådan. It serves as the common rear light of two pairs of range lights. Lillsand Light, standing on a submerged rock about $\frac{1}{3}$ mile northeastward of Äggbådan, in range 265° with Medelbådan Light marks part of the channel leading southward of Veckargrund.

Two beacons in range about 067° are located on the islet Lilla Gloppten, about $1\frac{1}{8}$ miles northeastward of Veckargrund, and in a position about $\frac{1}{3}$ mile southwestward of the former islet. This range marks part of the channel which passes northward of Veckargrund.

Svartsen Light is shown on the southwestern of the two rocks about $1\frac{1}{3}$ miles east-southeastward of Veckargrund Light structure.

From a position close eastward of Veckargrund, Rönnskären Channel leads eastward and northeastward for about $\frac{3}{4}$ mile, thence continues east-northeastward for about 8 miles to its intersection with the main approach channel in a position close northward of the spar buoy marking the northern side of Johansonsgrund, a shoal with a least depth of 4.9 m (2 $\frac{3}{4}$ fms.). For a continuation of this main channel into the harbor of Vaasa, see section 9B-9. Veckargrund Light, shown on that islet, in range $262\frac{1}{2}^\circ$ with Medelbådan Light marks the western $6\frac{3}{4}$ miles of this eastern reach; the eastern part, and its continuation in the main channel, is marked by two lights in range 081° , which are shown on the close-lying islets Kopparfuruskar and Stora Hogskar, located about 5 miles northwestward of Vaasa.

Shoals that lie near the channel fairway are marked by light buoys and/or spar buoys. The named shoals between Rönnskären and the main channel intersection include Glopptet, Holmbergsgrund, Lars Cruse, and Sextant.

Norrskär (Norrsher), about $9\frac{1}{2}$ miles north-northwestward of Medelbådan, consists of two large, low, rocky islets and several smaller islets which lie on a reef about $3\frac{1}{2}$ miles in diameter. The name Norrskär is

given to the western islet; the eastern islet is named Östra Norrskär.

9B-8 Norrskär pilot station is located on Norrskär. A lifesaving station, equipped with a line-throwing apparatus, is maintained on this islet.

Navigational aids.—Norrskär Light is shown on the western islet; a fog signal is sounded, and a radiobeacon is operated from the light station.

Medelbådan Light is shown on an islet of that name located $3\frac{1}{2}$ miles westward of Lagbådan.

Lillsand Light is located on a submerged rock about $\frac{1}{3}$ mile northeastward of Aggbådan.

A light is shown on the small islet Norrkallan about $\frac{3}{4}$ mile west-northwestward of Norrskär Light.

Range lights, leading into the pilot boat harbor, are shown on a small islet close eastward of Norrskär.

Östra Norrskär Light is shown on the northeastern point of that islet. A beacon stands on the northern side of the islet.

Skvattan Rear Range Light is shown on the northwestern extremity of an islet of that name located about $6\frac{1}{2}$ miles south-southeast of Norrskar.

Berggrynnan Front Range Light is shown on an islet of that name about $2\frac{1}{2}$ miles east-northeast of Skvattan.

Skotgrund Range Lights are shown on an islet of that name about $4\frac{3}{4}$ miles east northeastward of Berggrynnan.

Depths and dangers near Norrskar.—Vesterkallan, with a depth of 8.2 m (4 $\frac{1}{2}$ fms.) and marked by a spar buoy with a cross above a ball, lies about $1\frac{3}{4}$ miles west-northwestward of Norrskar Light; two detached shoals with depths of 9.1 (5 fms.) and 10.0 (5 $\frac{1}{2}$ fms.) meters, lie about 4 and 5 miles northwestward of Norrskar Light. Nygrund, a 2.7 m (1 $\frac{1}{2}$ fms.) shoal marked on its western side by a spar buoy lies about $1\frac{1}{2}$ miles southward of the lighthouse. Berggrund, with a depth of 4.5 m (2 $\frac{1}{2}$ fms.) and marked on its southern side by a spar buoy, lies about $2\frac{1}{2}$ miles southward of Östra Norrskar. Fyrvaktargrund, a 5.5 m (3 fms.) shoal, lies about $1\frac{1}{2}$ miles southeastward of Östra Norrskar Light; Osterkallan, with a least depth of 5.5 m (3 fms.) and marked on its eastern side by a spar buoy, lies 2 miles eastward of the lighthouse. A spar buoy is moored about $\frac{1}{4}$ mile northeastward of a shoal, with a least depth of 6.5 m (3 $\frac{1}{2}$ fms.),

which lies about 1 mile east-northeastward of Ostra Norrskar Light. The western, northern, and southeastern sides of the rocky area forming Norrskar are marked by spar buoys. The shoal extending north-northwestward of Skotgrund with a least depth of 2.7 m (9 ft.) is marked by a beacon with a radar reflector about 1 mile and a spar buoy about 2 1/2 miles, both north-northwest of Skotgrund.

Rabergskallan (Robertskallen), a shoal with a least depth of 0.9 m (3 ft.) and marked on its southwestern side by a spar buoy, lies about 4 1/4 miles northeastward of Ostra Norrskar Light.

Channel southward of Norrskar.—The channel leading toward Vaasa from the west-northwest passes southward of Norrskar and can be used by vessels with draft of 26 feet. This channel has two legs marked by range lights, with a total distance of about 11 1/4 miles to its intersection with the main channel. It is entered at a position about 4 1/4 southward of Norrskar Light; the reach is marked by Skotgrund range lights bearing 091°. An 8.2 m (4 1/2 fms.) shoal on the south side of the channel, about 1 3/4 miles north-northeastward of Skvattan range light, is marked on the north side by a spar buoy. The course 091° is held for about 5 3/4 miles until the inner reach is indicated by two lights in range 062°. The course of 062° is held for about 5 1/2 miles until joining the main channel about 2 1/4 miles north-westward of Norra Gloppsten; thence as indicated in (sec. 9B-9). Dania, a shoal with 3 m (1 3/4 fms.) on the north side of the channel about 2 1/4 miles north-northwestward of Skotgrund Front Range Light, is marked by a Lighted buoy.

9B-9 Main approach channel—Navigational aids.—The main channel, which is available to vessels with a draft of 26 feet, is entered about midway between the spar buoy marking the shoal about 1 mile east-northeastward of Östra Norrskär Light and the spar buoy marking Råbergskallan. The total distance along this approach channel is about 25 1/3 miles. It trends east-southeastward from the entrance for about 4 1/4 miles, thence south-southeastward for 10 1/3 miles to the intersection with the eastern part of Rönnskären Channel (sec. 9B-7), thence east-

northeastward for about 4 miles, and thence east-southeastward for about 6 3/4 miles to a position close westward of the principal berths of the port of Vaasa. Shoal areas adjacent to this track are marked by spar buoys with designating topmark.

A continuation of the first, or outer reach, of the main channel leads more directly southeastward toward the harbor. It passes within 3/4 mile of the southwestern coast of Vallgrund, a large island about 12 miles eastward of Östra Norrskär, and about 1/3 mile southwestward of Korsö, a small island lying close to Vallgrund. This shorter approach is limited to vessels with a draft of 18 feet.

A beacon in the southern part of Korsö in range 118° with a beacon on Malvetung, a small islet about 1 mile southeastward, marks the first reach of the main approach channel. A lighted bell buoy is moored on the western side of a 7 m (3 3/4 fm.) patch about 6 1/4 miles eastward of Ostra Norrskar Light. Korso Light is shown on the western side of Korso.

Norra Gloppsten, a shoal with a least depth of 1.8 m (1 fm.) lies about 2 1/2 miles east-northeastward of Skotgrund. It is marked on its northeastern side by a light and a spar buoy. A fog signal is sounded at the light.

The second reach of the main approach channel leads northeastward of Norra Gloppsten with the light beacon on Västerhuvudet, an islet about 7 1/4 miles southeastward of Norra Gloppsten, in range 138° with a light beacon on Tjärnbåden, another islet about 3 miles further southeastward. Spar buoys mark dangers adjacent to the channel.

The Kopparfurusjär—Stora Högsjär range (sec. 9B-7) marks the third reach of this approach channel, leading northward of Nygrund until Storhasten lighted beacons bearing 141° come in range, thence to the inner reach.

The inner reach of the channel is indicated by two lights in range 112°. The front light is shown at the edge of a shoal extending from Storhasten, an islet about 4 1/2 miles

east-northeastward of Väterhuvudet. The rear light is shown at Nagelprick in a position about 2 miles east-southeastward of the front light. Norra Hästen Light is shown from a submerged rock close northeastward of Storhästen front light. The reach passes between Storhästen and Norra Hästen Lights and is well marked by spar buoys.

Caution.—A rock, with a depth of 7.7 m (25 ft.), lies about 50 yards east-northeastward of Storhasten Light.

9B-10 Valassaaret (Valsöarne) is an island group on the southeastern side of Östra Kvarken. Storskär, the largest island of the group, lies about $14\frac{1}{4}$ miles northeastward of Östra Norrskär. Foul ground extends about $8\frac{1}{2}$ miles westward from Storskär as far as Snipan (sec. 9C-7). A foul area, with numerous above-water rocks and about $3\frac{1}{2}$ miles wide, extends up to $3\frac{1}{4}$ miles northeastward from the islands; two spar buoys mark its northern edge. A 7.6 m (4 $\frac{1}{4}$ fms.) shoal lies about 5 $\frac{3}{4}$ miles east-northeastward of Valassaaret Light. Many detached shoals lie up to 3 miles eastward of Malskar, the southeastern island of the group.

Valassaaret Light ($63^{\circ}25' N.$, $21^{\circ}04' E.$) stands in the southwestern part of Storskär.

A lifesaving station, equipped with a lifeboat, is located on Storskär.

Anchorage can be taken eastward of Malskär by vessels with local knowledge and a draft not exceeding 10 feet. Two sets of range beacons lead into the anchorage; two spar buoys also mark the approach.

Ritgrund Light is shown on a small islet of the same name located about 12 miles eastward of Valassaaret Light and centered on a reef about 1 mile long, north and south, and about $\frac{3}{4}$ mile wide. Ritgrund pilot station is located on the islet near the light station. Pilots for Vaasa and the loading places and anchorages in the vicinity can be obtained here.

Norrgrund, a shoal with a least depth of 5.8 m (3 $\frac{1}{4}$ fms.) and marked on its northwestern side by a spar buoy, lies about 1 mile northward of Ritgrund. Svartgrund, a 5.8 m (3 $\frac{1}{4}$ fms.) shoal marked on its northern side by a spar buoy, lies about 1 $\frac{1}{4}$ miles west-northwestward of Ritgrund. The northern channel leading to the harbor of Vaasa passes eastward of Svartgrund and westward of Norrgrund and Ritgrund. Buoys, beacons, and range lights mark the various reaches of this approach. A pilot is necessary for this channel.

Mickelsörar (Mickelsöarne), a group of islands surrounded by numerous islets, rocks, and shoals, lies about 15 miles eastward of Valassaaret and with its two principal islands, Källskär and Vildskär, about 5 and $7\frac{1}{2}$ miles, respectively, eastward of Ritgrund.

Västra Pohjanpiltti (Pokhianpileti), a rocky 5.5 m (3 fms.) patch marked by a spar buoy, lies about 3 $\frac{1}{4}$ miles north-northeastward of Ritgrund. Östra Pohjanpiltti, with a depth of 7.4 m (4 fms.) lies about $\frac{3}{4}$ mile eastward of Västra Pohjanpiltti and is marked on its northwestern side by a spar buoy.

Gryningskallan (Gnyudingskallan), a shoal area with depths of less than 1.8 m (6 ft.), lies $\frac{5}{6}$ mile north-northwestward of Gryningen (Gnyudingen), the northernmost islet of Mickelsörar, and about 6 $\frac{1}{3}$ miles north-eastward of Ritgrund. A beacon stands on Gryningen, and another beacon stands on Boskai (Busher), an island about $\frac{1}{3}$ mile southward.

Off-lying dangers northward of Mickelsörar are described in section 9B-3.

9B-11 Gloskär (Glosheret) is an anchorage and loading place about $8\frac{3}{4}$ miles south-southeastward of Ritgrund. The anchorage area is located close northward of the islet Gloskär and between the islands Lillö and Koklot. It is reached from the northward through the outer reach of the northern

channel leading toward Vaasa, thence through a channel continuing southward, eastward, southeastward, and southward from that approach channel. **Truthällan Light** and **Grillskär Light**, in range 171° and located about $8\frac{1}{2}$ and $9\frac{1}{4}$ miles, respectively, southward of Ritgrund, lead through the outer reach; three pairs of range beacons mark the other channel reaches. A draft of 16 feet can be taken to Gloskär anchorage through this approach.

Another approach channel, leading toward the harbor of Vaasa from the northeastward, marked by buoys and range beacons, and available to vessels with a draft of 13 feet, leads among the islands and islets lying between Koklot and the southern part of Mickelsörar and joins the easterly track leading to Gloskär in a position about $1\frac{1}{2}$ miles northwestward of that anchorage.

The description of the islands, channels, landmarks, and loading places northeastward of Vaasa is continued in section 9B-21.

VAASA

Position: $63^{\circ}05' \text{ N.}, 21^{\circ}34' \text{ E.}$

Depths: Main approach channel, 26-foot draft.
Harbor channels, 13- to $25\frac{1}{2}$ -foot draft.
Berths, 6 to 26 feet.
Harbor anchorages, 15 to 26 feet.

Tidal rise: Negligible.

Port plan: See section 9B-20.

9B-12 The port of Vaasa (Wasa) is located on the Finnish coast bordering on Norra Kvarken and about 184 miles north-northeastward of Understen (sec. 6B-1), the large rock in the southwestern part of Södra Kvarken. The harbor area of Vaasa comprises the facilities at the outer harbor of Vaskiluoto, those at Palosaari to the northward and those at the inner, or town, harbor.

NAVIGATION

9B-13 From a position in the southern part of the Gulf of Bothnia about 1 mile northeastward of Grundkallen Light Vessel (sec. 6C-5), a course of 015° for 167 miles, passing $2\frac{3}{4}$ miles westward of Norrskär Light (sec. 9B-4), leads to a position the same distance northwestward of that light; thence a course of 065° for 5 miles leads to a position in the Vaasa main approach channel (sec. 9B-9) about $2\frac{3}{4}$ miles northward of Östra Norrskär Light. The least charted depth along this track is 9 fathoms, which is found northward of Norrskär.

ICE

9B-14 During the 20-year period of 1930 to 1950 the harbors of Vaasa were closed to navigation because of ice on dates varying between December 25 and January 25 and were reopened on dates ranging from March 31 to May 16. Icebreaker service is furnished at the beginning and end of the ice season.

WATER LEVEL

9B-15 The water in the harbors rises with southerly winds and falls with northerly winds. See section 1-36.

DEPTHS

9B-16 Depths in the various approach channels are given in section 9B-3. General depths in the outer harbor are 16 to 30 feet. Between the island Vaskiluoto and the facilities of the inner harbor the general depth is 13 feet, and in the sound between the islet Mansikkasaari and Palosaari it is 14 feet. The following drafts can be taken through the harbor channels: from a position about 550 yards west-northwestward of the breakwater to the main piers of Vaskiluoto, $25\frac{1}{2}$ feet; to the oil pier in the southern part of Vaskiluoto, 23 feet; to the Vaasa

Sugar Company pier in the northwestern part of Vaskiluoto, 15 feet; to the inner harbor, $15\frac{3}{4}$ feet; into the sound at Palosaari, $11\frac{3}{4}$ feet. The principal berths at Vaskiluoto have depths of 16 to 26 feet alongside; depths at the other berths in the harbors are given in section 9B-20.

HARBORS

9B-17 Outer harbor.—Vaskiluoto (Vasklot), an island with two headlands projecting from its northern side and the islet Porvarinsaari joined to its southern side, is about 1 mile in diameter. A causeway, along which a highway and railroad tracks are laid, connects Vaskiluoto with the western part of the town of Vaasa. Hietosaari, a small islet, lies northward of and is joined to the middle of the causeway. The outer harbor of Vaasa extends along the southern and western sides of Vaskiluoto. An oil pier projects from the western side of Porvarinsaari. The two principal piers of the port extend from the southwestern side of Vaskiluoto. Vaasa Sugar Company's pier is located on the northern side of the island's western headland.

A new oil harbor, located on the southern side of Vaskiluoto, has an oil pier 96 feet long with a depth of $26\frac{1}{4}$ feet alongside. The dredged channel leading to the pier is also $26\frac{1}{4}$ feet deep.

A protective **breakwater**, extending about 290 yards north-northeastward and marked on its southern end by a light, is located about $\frac{1}{2}$ mile west-northwestward of the two principal piers on Vaskiluoto.

Fjällskär (Fierdskär) is a small island lying on the northwestern side of the harbor area about $\frac{3}{4}$ mile westward of the northern

end of Vaskiluoto. Two groups of small islets lie between the two islands; the buoyed harbor channels pass on either side of them.

Inner harbor.—This harbor, known also as the town harbor, is located on the northwestern side of the town and to the eastward of Vaskiluoto. Two lights, shown in the town and in range 118° , lead into the harbor. Another pair of range lights leads southeastward along the western side of the town.

Palosaari (Brändö) harbor.—This older part of the port of Vaasa extends along the southwestern side of Palosaari, a town on the southern end of a peninsula to the northwestward of Vaasa. The harbor area lies in a narrow sound formed between Palosaari and the islet Mansikkasaari, to the southwestward. Two lights in range 045° , which mark one of the harbor channels, are shown in the western part of Palosaari. A causeway, joining the towns of Vaasa and Palosaari, extends across the southwestern end of Onkilahti, a bay on the eastern side of Palosaari.

Anchorage are charted inside the harbor area in a position southward of Vaskiluoto about 200 yards southwestward of the oil pier in a depth of about 26 feet, mud, and also about $\frac{3}{4}$ mile northeastward of Fjällskär in a depth of about $15\frac{3}{4}$ feet, mud.

Range lights are shown on Edvard, an islet about $\frac{1}{4}$ mile southwestward of the main Vaskiluoto piers, and on the mainland about $\frac{1}{2}$ mile southward; in range $187\frac{1}{2}^\circ$, they mark a channel leading through the outer harbor. Two beacons, located about 2 miles northward of Edvard, line up with these range lights.

PILOTS

9B-18 Vessels from seaward can obtain pilots from the station on Rönnskär (sec. 9B-6) or the one on Norrskär (sec. 9B-8). Vessels coming from the northward through the northern inner channels embark pilots at Ritgrund (sec. 9B-10). Pilotage is compulsory; see section 1-24. The harbor pilot station is located on the western side of Vaskiluoto and is equipped with a radiotelephone.

DIRECTIONS FOR ENTERING

9B-19 Directions for the deeper main channel (sec. 9B-9) only are given. From a position about $2\frac{3}{4}$ miles northward of Östra Norrskär Light (sec. 9B-13), steer through the first reach of the channel with the beacons on Korsö and Malvetung in range 118° for $6\frac{1}{2}$ miles to a position about $\frac{1}{3}$ mile northwestward of the lighted bell buoy, when the range light structures on Västerhuvudet and Tjärnbådan come in range 138° .

Steer on this range for $10\frac{1}{3}$ miles, passing close northeastward of the light and the spar buoy marking Norra Gloppten and thence between spar buoys marking shoals on either side of the track to the southeastward, to a position close northward of the spar buoy marking Johansonsgrund, when the Kopparfurskär—Stora Högsjär lights come in range 081° .

Steer on this range for about 5 miles, passing southward of two spar buoys marking shoals extending southward and southwestward from Ensten, an islet about $2\frac{1}{3}$ miles northward of Västerhuvudet, to a position close northeastward of the buoy marking the northern extremity of Nygrund where the Storhasten lighted beacons come in range bearing 141° , until Storhasten and

Nagelprick Lights come in range bearing 112° , thence between Storhasten and Norrahasten Lights. Continue through the buoyed channel passing southward of Nagelprick, thence to the harbor entrance with Nagelprick and Storhasten Lights bearing 292° astern.

Caution.—An unmarked submerged rock lies about 50 yards east-northeastward of Storhasten Light (sec. 9B-9).

FACILITIES

9B-20 Vaasa is an important industrial town located on the mainland abreast the island Vaskiluoto. In 1957 its population was 42,860. Gamla Vaasa, the old town, is located about $3\frac{1}{2}$ miles southeastward of Vaskiluoto. Palosaari (Brändö) is a populated area about $\frac{1}{2}$ mile northwestward of the main town. Employment in the Vaasa area is provided by a number of factories, including a sugar refinery, cotton mill, flour mill, and various smaller enterprises. The most important exports of Vaasa include sawn wood products, paper, tar, and timber. Customs entry is made at Vaasa.

Berths.—Vaskiluoto harbor has about 2,400 feet of berthing space with depths of 16 to 26 feet alongside the two main piers.

Oil pier (stern mooring)—construction, wood on caissons; depth alongside, about $16\frac{1}{2}$ feet.

Vaasa Sugar Company's pier—construction, wood; berthing length, about 180 feet; depth alongside, about $16\frac{1}{2}$ feet.

Three 5-ton movable electric cranes are located on the southern main pier. The two main piers and the three stone piers are served by railroad.

Inner harbor:

Packing House Wharf—construction, wood on piles; berthing length, about 443 feet; depth alongside, about 16 feet.

Swedish Pier—construction, wood on piles; berthing length, about 770 feet; depth alongside, about 16 feet.

Park Pier—construction, wood on caissons; berthing length, about 197 feet; depth alongside, about $6\frac{1}{2}$ feet.

Railroad Wharf—construction, wood on piles; berthing length, about 197 feet; depth alongside, about 15 feet.

Equipment Wharf—construction, wood; berthing length, about 220 feet; depth alongside, about 14 feet.

Dock Piers—construction, wood; berthing length, about 252 feet alongside each of two piers.

Railroad tracks are laid on Packing House Wharf, Swedish Pier, and Railroad Wharf. A crane of 20 tons capacity is located on Equipment Wharf.

Palosaari harbor:

Cotton Mill Wharf—construction, wood on caissons; berthing length, about 164 feet; depth alongside; about 13 feet.

Passenger Pier—construction, wood on caissons; berthing length, about 210 feet; depth alongside about 13 feet.

Power Station Wharf—construction, wood; berthing length, about 194 feet; depth alongside, about 12½ feet.

A salvage tug stationed in the port is occasionally used to assist in berthing. Several 200-ton covered lighters are available for cargo work.

Supplies.—Provisions and ship's stores can be procured. Water is piped to the inner and Vaskiluoto harbors. Coal and fuel oil are available.

Repairs.—Most ship repairs can be effected. A salvage vessel is stationed in the harbor. Divers are available. A small marine railway on the islet Mansikkasaari has an extreme length of 470 feet, a cradle length of 175 feet, draft of 6 feet forward and 13 feet aft, and a lifting power of 600 tons. Vessels up to 200 tons deadweight can be accommodated.

Communications.—During the navigation season regular steamer service is maintained to Ömsköldsvik and Stockholm. Vaasa is served by railroad. The town has telephone, telegraph, and radio services.

Medical.—A hospital at Vaasa accepts seamen.

LOADING PLACES NORTHEASTWARD OF VAASA AND THEIR APPROACHES

9B-21 Tottesund (Lekmosund) ($63^{\circ}16' N.$, $21^{\circ}57' E.$) is a loading place about 8 miles southeastward of Ytter Uddskär and about 13 miles northeastward of Vaasa. The anchorage area, located about ⅓ mile northward of the island Bodö (Boden), is approached through the several reaches of a channel marked by buoys and four pairs of range beacons. A draft of 18 feet can be taken to this sheltered inner anchorage. A draft of 23 feet can be taken to an anchorage

which is indicated close westward of the approach track about $1\frac{2}{3}$ miles north-northwestward of the northern end of Bodö.

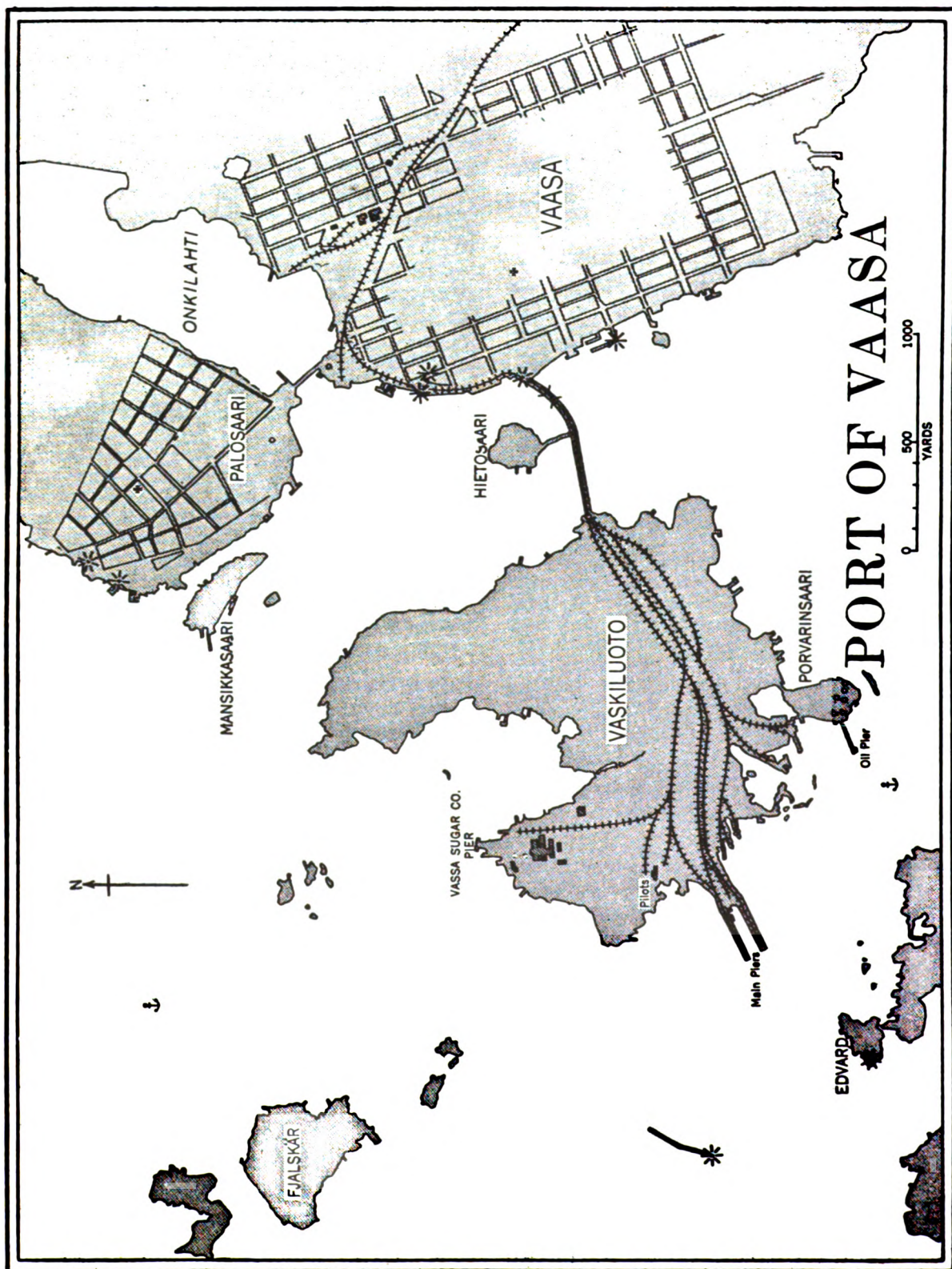
Vessels approaching Tottesund leave the channel (described below), which leads from Stubben to Ytter Uddskär, in a position about $7\frac{1}{3}$ miles east-northeastward of Ytter Uddskär and continue southward and southeastward for about $8\frac{1}{3}$ miles to the inner anchorage. Pilots can be obtained from Masskar, Vaasa, or Ritgrund.

Stubben, consisting of the two small islands Lillskär and Storskär, a small islet, and some rocks, lies up to $3\frac{3}{4}$ miles offshore and about $9\frac{1}{2}$ miles westward of Uusikaarlepyy (sec. 11A-6). A depth of $5\frac{1}{2}$ fathoms lies nearly 1 mile northward of Lillskär. Svartör and Stor Ljusén are two larger islands lying about 3 and 5 miles, respectively, south-southwestward of Stubben. Several smaller islands, islets, and rocks are located near each of the latter two islands. Numerous islets and dangers lie between Stubben and the eastern side of Mickelsörar (sec. 9B-10), about 10 miles southward.

Stubben Tower ($63^{\circ}31' N.$, $22^{\circ}10' E.$), a 55-foot red wooden hexagonal tower, surmounted by a cross, stands near the middle of Storskär. It is a good mark for vessels approaching the loading places southward and southeastward of Stubben.

Stubben Light is shown on the eastern side of Lillskar.

A channel, leading in a general southwest-erly direction from Stubben to Ytter Uddskär, passes westward of Svartör and Stor Ljusén and northwestward of Västerö, a



large island about $2\frac{2}{3}$ miles southwestward of Stor Ljusén. The channel is marked by buoys, two pairs of **range beacons** located on the western and southwestern sides of Stor Ljusén, and a pair of **range beacons** on the northwestern side of Västerö. A draft of 13 feet can be taken through the channel as far as Ytter Uddskär, although parts of the channel can accommodate deeper drafts.

9B-22 Kantlax (Kantlaks) ($63^{\circ}25'N.$, $22^{\circ}16'E.$) is a village on the mainland about $4\frac{1}{2}$ miles eastward of Stor Ljusén. Good anchorage can be taken by vessels with local knowledge in depths of 11.5 m (6 fms.), sand and clay bottom. Pilots are required and can be obtained from Maskar, Vaasa (sec. 9B-18), or Ritgrund (sec. 9B-10) pilot stations. Tank vessels enroute to Kantlax should arrange for a pilot from the Maskar pilot station 24 hours before arrival. A draft of 23 feet can be taken through a channel marked by buoys and range beacons. Pass westward of Stor Ljusén about 600 yards and with Osterö range beacons in line 179.5° steer on that reach for about 1 mile, until the beacons on Granskarbadan and Nalskar are in range 124° ; this track is held until the beacon on the southern end of Björkskar and the beacon on the eastern side of Stor Ljusén are in range astern 320° ; keeping that range astern for about $2\frac{1}{2}$ miles until the range beacons on Nalot come in range 257.5° ; keep Nalot range astern for about $1\frac{1}{2}$ miles until the beacons in Kantlax come in range 358.5° . This reach will pass through the buoys marking the channel to the anchorage of Kantlax.

Hellnäs ($63^{\circ}17'N.$, $22^{\circ}14'E.$), a village on the mainland about 15 miles southward of Stubben and $19\frac{1}{2}$ miles northeastward of

Vaasa, is the loading place for the sawmills of the vicinity. The protected roadstead of this loading place lies about $\frac{3}{4}$ mile northward of the village between the northeastern extremity of the island Lill-Okskangarö, the southwestern side of the island Stora Bockholm, and the mainland to the eastward. A draft of 23 feet can be taken to a position about $2\frac{1}{2}$ miles north-northeastward of the roadstead; a draft of 16 feet can be taken to the **anchorage area** in the roadstead; a draft of 8 feet can be taken up to a bridge, which spans the narrow passage between Lill-Okskangarö and the village of Hellnäs.

Oravainen (Oravais) is a town on the mainland about $4\frac{1}{2}$ miles east-northeastward of Hellnäs.

The coast between Svartor and Hallgrund, about $12\frac{1}{2}$ miles north-northeastward, is formed by two irregular mainland projections, a narrow inlet between them, the island Torso, and numerous islets and rocks. Except for a few detached shoal patches (described below), all the charted dangers near this coast are contained within the 5-fathom curve, which follows the coastal trend up to about 1 mile offshore.

9B-23 Monasvik, an inlet that extends about $4\frac{1}{2}$ miles southeastward from its narrow entrance about 4 miles southeastward of Stubben, is shallow in its southern part and has a maximum width of about $\frac{3}{4}$ mile. An island and several islets lie in the middle of Monasvik. Anchorage can be taken in the inlet in depths of 9.1 (5 fms.) to 11.0 (6 fms.) meters abreast Strommings, a small village on the northwestern shore about 1 mile within the entrance.

An approach channel, suitable for vessels with a draft of 22 feet, leads southeastward for about $4\frac{1}{3}$ miles to Monäsvik entrance from a position close northeastward of a buoy marking the eastern side of a $17\frac{1}{4}$ -foot shoal that lies about 2 miles east-northeastward of Stubben Tower. Buoys mark the channel. Two beacons, in range 148° and located in the northwestern part of the inlet, mark the approach channel as far as a position about $\frac{1}{3}$ mile northwestward of the entrance. Pilots are required and can be obtained from Masskar, Vaasa, or Rätgrund pilot stations.

A detached $3\frac{3}{4}$ -fathom patch, marked on its northwestern side by a spar buoy, lies about $\frac{3}{4}$ mile outside the 5-fathom curve in a position about $2\frac{1}{2}$ miles northeastward of Stubben Tower. Three patches with depths of $5\frac{1}{2}$, 5, and $4\frac{3}{4}$ fathoms lie between 2 and $4\frac{1}{4}$ miles northeastward of Stubben Tower. A depth of $5\frac{1}{4}$ fathoms lies about $2\frac{1}{2}$ miles north-northeastward of the same tower.

A light is shown on Remsan, an islet located about 3 miles east-southeastward of Stubben Tower.

Torsö (Turse), an island about 2 miles long north and south, lies with its northern extremity about $1\frac{2}{3}$ miles southwestward of Hällgrund. Many close-lying islands and islets lie near Torsö and between it and the mainland projection to the southward. The edge of the shoal water extending about 1 mile northward from Torsö is marked by a spar buoy. A $1\frac{3}{4}$ -fathom shoal, marked on its northern side by a spar buoy, lies about 1 mile westward of Hällgrund.

ANCHORAGES

9B-24 Rönnskär Harbor.—See section 9B-7.

Eastward of Malskär.—See section 9B-10.

Gloskär.—See section 9B-11.

Vaasa.—See section 9B-17.

Tottesund.—See section 9B-21.

Kantlax.—See section 9B-22.

Hellnäs.—See section 9B-22.

Monäsvik.—See section 9B-23.

Part C. NORRA KVARKEN

9C-1 Sydstbrotten Light ($63^\circ 20' N.$, $20^\circ 11' E.$), located in the middle of the southwestern entrance to Norra Kvarken, is described in section 9A-3 together with Vernersgrund, Sydstbrotten and other dangers lying between the light and Bonden, about $6\frac{3}{4}$ miles northwestward.

GENERAL REMARKS

9C-2 Norra Kvarken (North Quarken), the narrowest part of the Gulf of Bothnia, includes the waters extending about 40 miles northeastward from a line joining Bonden, Sydstbrotten, and Norrskär. It is encumbered with numerous islands, islets, rocks, and shoals and is divided into two channels or passages, Västra Kvarken and Östra Kvarken, by Holmöarne, an island group that extends about 14 miles northward from a position about $22\frac{1}{2}$ miles northeastward of Sydstbrotten Light. Hölmo, the northern and largest of these islands, lies 4 miles, and Holmögådd, the southern island, lies about 10 miles off the Swedish coast.

Holmögådd is not wooded except for a few groups of low trees and bushes; it is separated from the reef extending from Grossgrund by Gaddströmmen. The three northern islands, Grossgrund, Ängesö, and Holmö, appear as a long and in general a low woodland, with the openings through the small sounds separating them visible only from certain directions. These sounds are full of shoals and are not navigable. The highest place is in the northern part of Holmö, where it is 79 feet in height and consists of a bare ridge surrounded by woods. On the ridge are several mills, houses, and a church with a high pointed tower.

Caution is necessary when navigating Västra Kvarken and Östra Kvarken, particularly during foggy weather, which is not infrequent; bear in mind that the currents are uncertain and that their movements sometimes precede the wind. Buoys are sometimes displaced by drift ice in the early part of the navigation season, and by being fouled by timber rafts.

Patches with depths of $5\frac{1}{4}$ to $7\frac{1}{2}$ fathoms exist in the southern approaches to Västra Kvarken and Östra Kvarken, in the northern approach to Östra Kvarken, and in the northern channel in Östra Kvarken.

VÄSTRA KVARKEN (WEST QUARKEN)

9C-3 The southern entrance of this western channel of Norra Kvarken can be considered lying between the southern end of Holmögadd and Bredskär (sec. 9A-20), a small island in the approaches to Umeå about $12\frac{1}{4}$ miles west-northwestward. The northern entrance is close westward of Ellagrundet Light Buoy (sec. 9C-4), which lies about $2\frac{1}{2}$ miles north-northwestward of the northern extremity of Holmö. The navigable width of the passage is reduced by dangers extending from the Swedish coast and those fringing Holmöarne; the least width of about $1\frac{1}{2}$ miles is found between the northwestern extremity of Holmö and Tarngrund (sec. 9A-4), a group of shoals lying west-northwestward of that island.

Directions for Västra Kvarken begin at Sydostbrotten Light in a position about $21\frac{1}{2}$ miles southwestward of the southern entrance of the channel; the distance in a north-northeasterly direction along the recommended track through Västra Kvarken itself is about $16\frac{1}{2}$ miles.

Depths.—General depths along the recommended track from Sydostbrotten Light and through Västra Kvarken are $8\frac{1}{2}$ to 20 fathoms; however, several 6-fathom patches lie very near the track.

Dangers on the western side of Västra Kvarken are described in section 9A-4.

9C-4 Dangers on the eastern side of Västra Kvarken.—The western side of Holmöarne forms a bight in which are a large number of dangers that extend out to and slightly beyond a line joining the western extremities of Holmögadd and Holmö.

A dangerous wreck lies about 9 miles south-southwestward of Stora Fjäderägg Light (sec. 9C-9).

Foul ground extends about $1\frac{3}{4}$ miles southward from the southern side of Holmögadd to Huggingrund, a $3\frac{1}{4}$ -fathom shoal marked on its southwestern side by a **spar buoy**. Yttre Gaddsnytan, a shoal awash and marked on its southwestern side by a **spar buoy**, lies on the southwestern edge of the foul ground about $1\frac{1}{4}$ miles offshore.

Utskottet, a shoal with a least depth of $1\frac{1}{2}$ fathoms and marked on its western side by a **spar buoy**, lies about $2\frac{1}{4}$ miles westward of the northern end of Grossgrund. Another **spar buoy**, marking the western side of a 2-fathom shoal, is moored about $1\frac{1}{2}$ miles offshore in a position about the same distance southwestward of the southern end of Holmö.

A dangerous wreck lies about 1 mile north-northeastward of Utskottet.

Lillhällan, a small bare rock marked by a **cairn beacon**, is located on the western side of Byviken entrance close off the northwestern side of Holmö.

Lillhällansgrund, a group of shoals with a least depth of $2\frac{3}{4}$ fathoms and marked on its southwestern side by a **spar buoy**, lies about $\frac{2}{3}$ mile northward of Lillhällan.

Falkgrund, a shoal with a least depth of $5\frac{1}{4}$ fathoms, lies about 2 miles north-northwestward of the northern extremity of Holmö. Ellagrund, with a depth of 4 fathoms, lies about $\frac{3}{4}$ mile eastward of Falkgrund, and a 5-fathom patch lies about the same distance westward of Falkgrund. A **spar buoy** is moored about $\frac{1}{4}$ mile northward of Falkgrund; Ellagrundet Lighted Whistle Buoy with a radar reflector is located about $\frac{1}{4}$ mile farther northward.

Submarine cables.—A cable (sec. 1-34) is laid across Västra Kvarken between the northwestern side of Holmö and Laduskär, a mainland projection about $4\frac{1}{4}$ miles north-westward. A pair of **range lights** on Holmö indicates the cable direction within 2 miles of the island. Cables are also laid from the northwestern part of Holmö in a general northwesterly direction to Norrfjärden. A cable is laid across Västra Kvarken between the western side of Holmögadd and Holmsund. Anchorage is prohibited within 220 yards of these cables.

Navigational aids.—The best aids on the western side of Västra Kvarken are the several marks on the outermost dangers (sec. 9A-4), some of which are located about 3½ miles offshore.

Holmögadd Light is shown on the southern end of Holmögadd. A fog signal is sounded and a radiobeacon is operated from the light station. A cairn beacon stands on the beach southward of Holmögadd Light. A beacon stands on the northern end of Holmögadd, and two beacons stand on Malgrund, an islet close eastward.

Two beacons are located on the northeastern side of Gaddströmmen among the rocks and islets extending southward from Grossgrund.

Bergudden Light is shown on the northwestern side of Holmö.

A light is shown on the western side of Byviken, a small fishing harbor on the northwestern side of Holmö about 1¼ miles north-eastward of Bergudden Light.

9C-5 Byviken (63°48' N., 20°52' E.) is a small bay that is entered southeastward of the rock Lillhällan. It is exposed to winds and heavy seas from north and northeast. Vessels with local knowledge can take anchorage in depths of 9.1 (5 fms.) to 11.0 (6 fms.) meters, sand and stone bottom. A draft of 8 ¾ feet can be taken through the approach channel. The bay is protected by two breakwaters the western one of which shelters a 79-foot quay on its inner side. There is about 430 feet of quayage with depths up to 3.8 m (12 ¾ ft.) alongside. Water and a limited quantity of provisions are available.

Lifeboat patrol.—A cruising rescue vessel named Grängesberg is stationed in Byviken.

During bad visibility she will patrol in Norra Kvarken and can be communicated with by radio via the station at Härnösand (sec. 7D-9). This vessel is equipped with radar and is able to assist in position finding during fog or bad weather.

9C-6 Directions for Västra Kvarken.—Vessels proceeding through Västra Kvarken from the southwestward can pass either northward of Bonden and thence between Vegagrund and Gunvorsgrund (sec. 9A-4), or eastward of Sydostbrotten (sec. 9A-3). In the latter case, from a position about 1½ miles southeastward of Sydostbrotten Light steer 041° for 15 miles and passing about 1¾ miles southeastward of Gunvorsgrund; then alter course to the left and steer 021°, which leads close westward of Bergudden Light. On the former course the vessel will pass close to several 11 meter (6 fm.) patches lying eastward and northeastward of Gunvorsgrund. Pass between the spar buoy marking Tarngrund (sec. 9A-4) and Bergudden Light, and when the light is abeam steer about 013°, passing between the spar buoys marking Svalgrund (sec. 9A-4) and Lillhallansgrund, to a position close westward of Ellagrundet Light Buoy, avoiding the 9.1 meter (5 fm.) patch located about ¾ mile westward of Falkgrund. For the navigational track from the light buoy see section 9A-5.

OSTRA KVARKEN (EAST QUARKEN)

9C-7 Ostra Kvarken is that part of Norra Kvarken lying between Holmoarne and Valassaaret (sec. 9B-10), an island group which is centered about 12 ½ miles southeastward of Holmogadd.

A channel marked by a light and spar buoys leads through Ostra Kuarken.

The directions for entering Ostra Kvarken begin at Sydostbrotten Light, about 19 miles southwestward of Nordvalen Light (sec. 9C-8).

Depths.—The least charted depth on the recommended track is 10.3 m (34 ft.); several 12 m (6 1/2 fm.) patches lie near the track. The navigational track leading north-northeastward along the east coast of Holmoarne from a position about 5 miles east-southeastward of Holmogadd has a least charted depth of 22 m (12 fms.), but a 14.6 m (8 fm.) patch lies near the track.

General depths in Ostra Kvarken between Holmoarne and Valassaaret are 22 to 37 m (12 to 20 fms.). The detached shoals in the southern part of this area are described in section 9B-3.

Snipan, the southeasternmost of the dangers in the entrance of Ostra Kvarken, has a least depth of 2.1 m (1 1/4 fms.) and lies about 10 miles southward of Holmogadd. Spar buoys mark its western, northwestern and southeastern sides. A 4 m (2 1/4 fm.) patch lies about 1/4 mile southward of Snipan. Ostra Snipansgrund, a shoal awash and with an above-water rock close northward of it, lies about 1 1/4 miles east-southeastward of Snipan. Medelkallen is an extensive shoal, with depths of less than 1.8 m (6 ft.) that lies between about 1 1/4 miles southeastward and 5 miles southward of Ostra Snipansgrund. Utgrynnan Light is shown from an islet that lies on the southwestern side of the shoal in a position about

14 1/2 miles southward of Holmogadd. Two 12 m (6 1/2 fm.) patches, one marked by a spar buoy on its northwestern side and one marked a buoy on its southeastern side, lie on either side of the channel about 4 and 5 miles, respectively, west-southwestward of Snipan. A 13 m (7 fm.) patch marked on its northeastern side by a spar buoy, lies about 5 1/2 miles west-southwestward of Nordvalen Light.

9C-8 Dangers on the southeastern side: Teutoniagrund, an 8 m (4 1/4 fm.) shoal marked on its southern side by a spar buoy, lies about 3/4 mile north-northeastward of Snipan. Fiskargrund, with a depth of 6.4 m (3 1/2 fms.) and marked on its northern side by a spar buoy, lies about 1 1/2 miles north-northeastward of Teutoniagrund; between the two shoals there is a patch with a depth of 6.8 m (3 3/4 fms.). Gurlisgrund, a 5.2 m (2 3/4 fm.) shoal, lies 1 1/4 miles northward of Fiskargrund.

Gerda Grund, a 5 m (2 3/4 fm.) spot, marked on its northwestern side by a spar buoy, lies about 1 1/2 miles south-southwestward of Nordvalen Light.

A 10.4 m (5 3/4 fm.) patch, marked on its northern side by a spar buoy, lies about 5 1/2 miles south-southwestward of Holmogadd Light. Nordvalensgrund, a 6.6 m (3 1/2 fm.) shoal, lies about 4 miles south-southeastward of Holmogadd Light. A spar buoy is moored about 3/4 mile east-northeastward of the shoal.

A spar buoy is moored on the northern side of the channel about 3 miles southeastward of Holmögdadd. Hugingrund and the foul area extending southward from Holmögdadd are described in section 9C-4.

Nordvalen Light ($63^{\circ}32' N.$, $20^{\circ}47' E.$) is located on the southern side of the channel in a position about $3\frac{1}{2}$ miles southward of Holmogadd. A fog signal is sounded. The light structure is floodlighted at night. A submarine cable is laid northward from the light and crosses the channel. A radiobeacon transmits from the lighthouse.

9C-9 Eastern side of Holmöarne.—This side of the island group is fronted by numerous rocks and shoals that extend up to $2\frac{2}{3}$ miles offshore. Spar buoys mark the outermost dangers.

Sjösäkan, a $3\frac{3}{4}$ -fathom shoal, is located about 3 miles eastward of the northern extremity of Holmögdadd. A spar buoy is moored on the eastern side of a 9.3 m (5 fm.) patch which lies about $1\frac{1}{2}$ miles southeastward of Sjosankan.

Vakaren, a 6 m ($3\frac{1}{4}$ fm.) shoal, lies about 2 miles south-southeastward of Jagaroren Light. A 13 m (7 fm.) spot marked by a spar buoy lies about $1\frac{3}{4}$ miles east-southeastward of Vakaren.

Halorens, a rock marked by a beacon, is located about 1,200 yards south-southwestward of Jagaroren Light.

Jagaroren Light is shown on a rock located about 1 mile southward of the southeastern point of Angeso. An 8 m ($4\frac{1}{4}$ fm.) shoal lies about $1\frac{3}{4}$ miles east-northeastward of Jagaroren Light. A 3.7 m (2 fm.) patch lies nearly 4 miles northeastward of the lighthouse. An 11 m (6 fm.) shoal marked on its southeastern side by a spar buoy, lies about

$4\frac{1}{2}$ miles east-northeastward of the lighthouse.

Soda Storgund, a shoal with a least depth of 3 m ($1\frac{1}{4}$ fm.), lies up to $2\frac{1}{2}$ miles offshore and extends about $2\frac{1}{4}$ miles northward from a position about $3\frac{1}{2}$ miles north-eastward of Jagaroren Light.

Norra Storgund, a shoal awash, is located about $1\frac{1}{3}$ miles northwestward of the northern end of Soda Storgund; a spar buoy is moored about $\frac{1}{2}$ mile eastward of the shoal.

Stora Fjaderagg, a barren island nearly 1 mile in diameter, lies about $1\frac{1}{4}$ miles east-northeastward of the northeastern extremity of Holmo. A light is shown from a tower standing in the middle of Stora Fjaderagg. A chapel and some fishing huts are located on the southern side of the island, and a beacon stands on its southern extremity. A submarine cable is laid between the southwestern point of Stora Fjaderagg and Holmo.

Vessels can take anchorage in depths of from 9.1 to 16.4 m (5 to 9 fms.), sand, about 600 yards southward of Stora Fjaderagg. Caution is required because of a reef that extends about 350 yards from the southern side of the island.

Lilla Fjaderagg is a small island lying about midway between Stora Fjaderagg and the northern end of Holmo.

Lillgrund, an above-water rock, lies about $\frac{3}{4}$ mile northward of Stora Fjaderagg.

Osterbadan, a 6 m ($3\frac{1}{4}$ fm.) shoal, lies $\frac{3}{4}$ mile eastward of the northern end of Stora Fjaderagg.

Mickelsgrund, a shoal with a least depth of 2.7 m ($1\frac{1}{2}$ fms.), lies about $2\frac{1}{4}$ miles northward of Stora Fjaderagg, and Pynnten, a $5\frac{1}{2}$ -fathom patch, lies 3 miles north-northeastward of the same island. Numerous shoals lie between Mickelsgrund and the northeastern side of Holmö.

9C-10 Directions for Ostra Kvarken.—From a position about 1 1/2 miles south-eastward of Sydostbrotten Light (sec. 9A-5), steer 046° for about 17 1/2 miles, passing about 2 1/2 miles southeastward of Gunvorsgrund, to a position about 1 3/4 miles west-southwestward of Nordvalen Light. This track, however, leads over a 10.4 m (34 ft.) patch, marked on its northern side by a spar buoy, located 5 1/2 miles southwestward of Holmogadd Light. Deeper water is available on either side of the track. From a position about 1 3/4 miles west-southwestward of Nordvalen Light, steer 070° through the northern channel, passing northward of Nordvalen Light and southward of the spar buoy moored about 3 miles southeastward of Holmogadd. Having passed the spar buoy continue on the 070° course to a position about 5 1/2 miles east-southeastward of Holmogadd.

Navigation.—Vessels continuing northward along the Swedish coast may, from the position about 5 1/2 miles east-southeastward of Holmogadd, steer a course of 024° for 15 1/4 miles to a position 5 1/4 miles eastward of the light on Stora Fjäderägg. This track passes over a least depth of 15.1 m (8 1/4 fms.). Navigation northward is continued in section 10A-4.

ANCHORAGES

9C-11 Byviken.—See section 9C-5.

Southward of Stora Fjäderägg.—See section 9C-9.

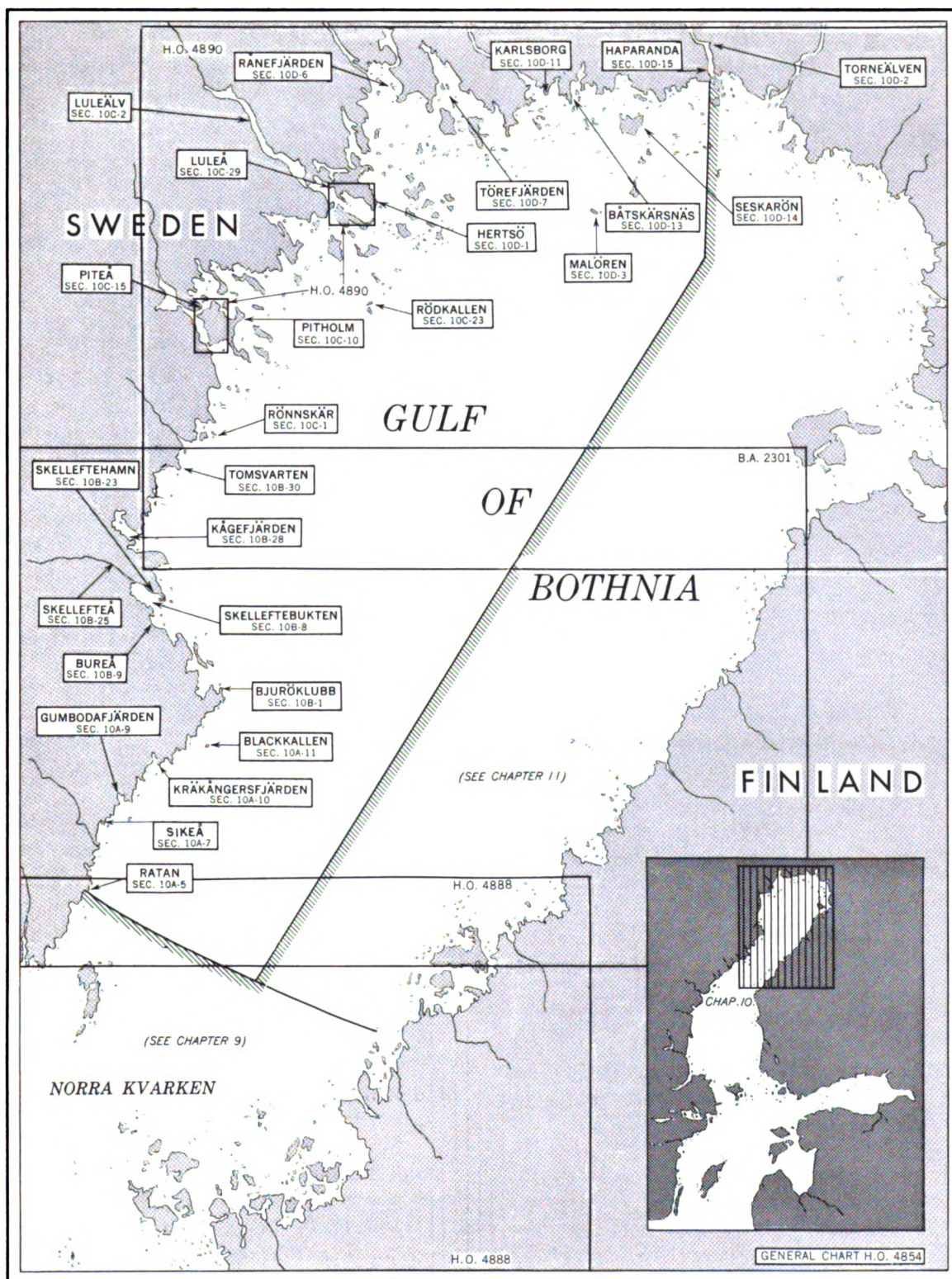


Chart limits shown are of the best scale charts issued to naval vessels by the U.S. Navy Hydrographic Office.
 Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 10—GRAPHIC INDEX

CHAPTER 10

EAST COAST OF SWEDEN FROM RATAN TO THE FINNISH FRONTIER

Part A. Ratan to Bjuröklubb.

Part B. Bjuröklubb to Rönnskär.

Part C. Rönnskär to Hertsö.

Part D. Hertsö to the Finnish frontier.

Plan.—This chapter describes the coast of Sweden bordering the western side and northern end of Bottenviken, the northern part of the Gulf of Bothnia. The arrangement is north-north-eastward from Ratan to Rånefjärden, thence eastward to the Finnish frontier.

GENERAL REMARKS

10-1 From Ratan the general trend of the coast is northeastward for about 33 miles to the peninsula of Bjurö. Between Bjurö and Rönnskär, an island lying about 35 miles northward, the coast forms a bight, thence trends irregularly north-northeastward for about 54 miles to the head of Rånefjärden. From this fjord the trend of the coast is eastward for about 45 miles to the frontier of Finland at the mouth of Torneälven.

This entire coast is very irregular, being indented by many bays, estuaries, and fjords, the most extensive of which are entered from the northwestern part of the gulf. Numerous islands, islets, and dangers front the coast, lying within $6\frac{1}{2}$ miles of it between Ratan and Rönnskär, and up to $28\frac{1}{2}$ miles from the mainland between Rönnskär and the Finnish frontier.

The principal port in this area is Luleå; there are also a number of smaller ports and loading places.

ICE

10-2 Ice conditions prevail in the area covered by this chapter; for particulars and ice chartlets, see chapter 1.

NAVIGATION

10-3 Vessels bound for destinations at the head of the Gulf of Bothnia and having arrived at a position about $5\frac{1}{2}$ miles east-southeastward of Holmögdadd (sec. 9C-4) may steer a course of $029\frac{1}{2}^{\circ}$ for about 133 miles to a position about 2 miles southwestward of the western end of Malören (sec. 10D-3), where pilots can be obtained. This track clears all dangers and leads over a least charted depth of $9\frac{3}{4}$ fathoms.

CURRENTS

10-4 See section 7-4.

Part A. RATAN TO BJURÖKLUBB

10A-1 Ratan ($63^{\circ}59' N.$, $20^{\circ}54' E.$) is fronted by Rätaskär, a wooded island 108 feet high and about $\frac{3}{4}$ mile long in a north and south direction. The island, together with the navigational aids on it and near it, is further described in section 10A-5 in connection with the port of Ratan.

COAST—GENERAL

10A-2 The coast trends irregularly north-eastward about 33 miles from Ratan to

Bjuröklubb, the northern extremity of the peninsula of Bjurö. This section is indented by a number of fjords and bights, and has off it a large number of shoals.

The principal fjords are Bygdeåfjärden, Sikeåfjärden, Gumbodafjärden, Kräkångersfjärden, and Kallviken, within all of which are ports or anchorage areas.

DEPTHS—DANGERS

10A-3 The depths off this section of coast are irregular. In general, the water shoals somewhat in the entrances to the various fjords. The 10-fathom curve is as close as 1 mile at various places on the unindented sections of the coast, but off the fjord entrances this curve lies off as far as 3 miles or more.

The dangers fronting this coast lie for the most part within the 10-fathom curve. The off-lying dangers are marked by buoys or beacons.

The depths and dangers along this section of coast are described in connection with the approaches to the various ports and anchorages.

NAVIGATION

10A-4 From a position about $5\frac{1}{4}$ miles eastward of Stora Fjärderägg Light (sec. 9C-9) a course of 024° for about $34\frac{3}{4}$ miles leads to a position about $5\frac{3}{4}$ miles eastward of Blackkallen Light (sec. 10A-11), thence a course of 017° for about 9 miles leads to a position about $6\frac{3}{4}$ miles eastward of Bjuröklubb Light (sec. 10B-1). This track leads over charted depths of more than 15 fathoms and clear of all dangers.

RATAN AND APPROACHES

10A-5 Ratan ($64^\circ 00' N.$, $20^\circ 54' E.$) is the narrow sound between the island of Rataskär and the mainland to the westward.

The northern part of the sound forms a roadstead exposed to winds from northeast-

ward and available to vessels with local knowledge.

The harbor area is off the town of Ratan, which is on the mainland abreast the middle of the sound.

Rataskär is a wooded island, about $\frac{3}{4}$ mile long in a north and south direction, attaining a height of about 108 feet. Norrklubb is its northern portion; Söderklubb is an islet connected to its southern end by a reef.

Navigation.—From the position on the coastal track about $5\frac{1}{4}$ miles eastward of Stora Fjärderägg Light (sec. 9C-9) a course of 324° for a distance of about 13 miles leads to a position off the entrance to the sound from the southeastward.

Vessels bound for Ratan from northeastward may leave the coastal track (sec. 10A-4) at a position about $5\frac{3}{4}$ miles southeastward of Blackkallen Light and steer a course of 228° for about 20 miles to a position about $\frac{1}{2}$ mile southeastward of the spar buoy marking Näsgrunden (sec. 10A-12). From that position a course of 238° for about 3 miles leads to a position about $\frac{1}{4}$ mile southeastward of the spar buoy marking Oscarsgrund. Seaward of Näsgrunden these courses lead everywhere over depths of more than 10 fathoms.

Depths.—The depths in the roadstead are $5\frac{1}{2}$ fathoms. The entrance to the sound from southeastward is available to vessels with a draft of $14\frac{1}{2}$ feet; the entrance from the northeastward is available to vessels with a draft of $8\frac{3}{4}$ feet. Vessels with a draft of $14\frac{1}{2}$ feet can secure to the wharves. It is reported that northerly winds may reduce the water level as much as $2\frac{1}{4}$ feet below mean level.

Dangers.—Rata Storgrund, a shoal area with a maximum length of about $2\frac{1}{2}$ miles in a north and south direction, lies centered in a position about 6 miles eastward of Rataskär Light and has a least depth of $1\frac{1}{2}$ fathoms. Four spar buoys, one each on the north-

ern and western sides and two on the eastern side about 2 miles apart, mark Rata Storgrund. In addition, a **lighted whistle buoy** is normally moored on the eastern side of the shoal about midway between the two spar buoys from 1 August until the close of navigation. The lighted whistle buoy and the spar buoy southward of it have **radar reflectors**.

Långrännagrund, a $1\frac{1}{2}$ -fathom shoal about $\frac{1}{2}$ mile southward of Söderklubb, is marked by a **spar buoy**.

The southern extremity and the eastern side of shoal water extending southeastward from Söderklubb are marked by **spar buoys**.

Oscarsgrund, over which the least depth is 3 fathoms, lies about $2\frac{1}{4}$ miles northeastward of the northern end of Norklubb. A spar buoy is moored close eastward of a $5\frac{1}{2}$ -fathom patch that lies about $\frac{1}{2}$ mile east-northeastward of Oscarsgrund.

A dangerous wreck lies about $1\frac{3}{4}$ miles eastward of Rataskär Light.

Lights.—Rataskär Light is shown on Rataskär; another light is shown on the mainland in a position about $\frac{1}{2}$ mile southward of Rataskär Light. A radiobeacon transmits at Rataskär.

Beacons.—Rataskär Beacon, standing close northwestward of Rataskär Light, is octagonal, and has a high pointed roof which is surmounted by a mast with a horizontal barrel and a vane; its seaward sides are painted red and white.

A beacon, consisting of a round-topped cairn painted white with a red band and 12 feet high, stands on Söderklubb. A similar beacon stands on Norrklubb.

Prohibited anchorage.—Anchorage is prohibited in the vicinity of a submarine cable extending from a position on Rataskär westward of Rataskär Beacon to the mainland close northward of the northernmost wharf.

Pilots.—Vessels can obtain pilots from the stations at Bredshar (sec. 9A-22) and Gasoren (sec. 10B-21).

Directions.—Vessels approaching Ratan from the southeastward should keep Rataskär Beacon between the bearings of 315° and 348° . At a distance of 2 to 3 miles from the beacon it should be brought in range bearing 346° , with the beacon on Söderklubb. This course passes close eastward of the spar buoy marking Långrännagrund, and westward of the spar buoy marking the southern end of the shoal water extending southeastward from Söderklubb. Course should then be altered as the entrance is approached so as to pass into the harbor, keeping close to the Rataskar shore. This entrance is about 130 feet wide.

Vessels approaching from the northeastward should steer 241° for Rataskär Beacon from a position about $\frac{1}{4}$ mile southeastward of the spar buoy marking Oscarsgrund. When the beacon on Norklubb can be identified it should be brought in range, bearing about 236° , with a white patch on Västra Klubben, the north-northwestern extremity of Rataskär.

Ratan is of interest principally as a loading place. There are two wharves, the northern about 295 feet long and the southern about 150 feet long. Vessels with a draft of $14\frac{1}{2}$ feet can come alongside the wharves; those of greater draft load from barges. The south wharf is in poor condition. A limited amount of provisions can be obtained. Water is available from wells. A tug is available. Ratan is in regular communication by steamer with Stockholm and other coastal ports.

COASTAL FEATURES

10A-6 The coast trends about 10 miles northward from Ratan to the entrance to Sikeåfjärden, which has the port of Sikeå in its inner part. This section has the extreme irregularity characteristic of coasts in the area.

Prastskar is an island about $2\frac{1}{2}$ miles northward of Rataskar (sec. 10A-5).

Depths—Dangers.—The 10-fathom curve is about $\frac{3}{4}$ mile off Rataskär, the island forming the eastern side of Ratan, and about 2 miles off Prästskär. The curve lies from $2\frac{1}{2}$ to 3 miles off the entrance to Sikeåfjärden. Numerous shoals off this section lie within the 10-fathom curve.

Rata Storgrund, which lies outside the 10-fathom curve, is described with Ratan. Similarly, Näsgrunden is described with Prästskär, and Rickleågrunden with Sikeå.

SIKEÅ

10A-7 Sikeå ($64^{\circ}09' N.$, $20^{\circ}59' E.$) lies near the head of Sikeåfjärden in a position nearly 10 miles northward of Ratan.

Navigation.—Vessels proceeding to the entrance to Sikeåfjärden from southward may leave the coastal track (sec. 9C-10) at the position $5\frac{1}{4}$ miles eastward of Stora Fjäderägg and steer a course of 000° for a distance of about 17 miles. This leads to a position 6 miles 297° from the entrance, when the directions given in this section can be followed.

Vessels leaving the entrance to Sikeåfjärden and proceeding northeastward and northward may rejoin the coastal track from a position 2 miles 117° from Sikeå Light by steering 074° for a distance of about $10\frac{3}{4}$ miles, and then a course of 037° for a distance of about $12\frac{1}{2}$ miles. This leads to the position on the coastal track about $5\frac{3}{4}$ miles eastward of Blackkallen Light.

Depths.—The fairway from sea to Sikeå is available to vessels with a draft of about 22 feet. A channel dredged to $18\frac{3}{4}$ feet leads to the wharves.

Depths of $1\frac{3}{4}$ to 4 fathoms are available in the harbor area for anchoring; the maximum depth alongside the wharves is $19\frac{1}{2}$ feet.

In Lägde Vik approach channel the least depth is 19 feet, and depths up to $4\frac{1}{2}$ fathoms are available in the area for anchoring; the maximum depth alongside a small wharf is 10 feet.

Dangers.—The outermost danger on the southwestern side of the fairway leading to the Sikeå harbor area is Rickleågrunden. The

least depth over this shoal area is $1\frac{1}{2}$ fathoms. It lies about $4\frac{1}{2}$ miles southeastward of Sikeå Light. Two spar buoys mark Rickleågrunden.

Rickleåsten, a small, dark-colored rock, is about $1\frac{1}{2}$ miles southeastward of Sikeå Light. A spar buoy is moored on the fairway side of the rock.

On the northeastern side of the fairway the only danger within a distance of 1 mile is Slingran, a $3\frac{3}{4}$ -fathom patch a little over $\frac{1}{2}$ mile east-southeastward of Sikeå Light. A spar buoy is moored on the fairway side of the shoal.

Lights.—Sikeå Light is shown on Kungsöhallan, an islet near the entrance to Sikeåfjärden in a position about 1 mile southward of the town of Sikeå. The islet is on the western side of the fairway.

Lights in range bearing 336° are shown in the town of Sikeå, and lead to the harbor area.

Beacon.—Hällgrund Beacon stands on a rocky islet, on the northeastern side of the fairway, in a position about $\frac{1}{2}$ mile northeastward of Sikeå Light. The beacon consists of a pole, 33 feet high, with supports covered with boards, and surmounted by two horizontal casks.

Anchorage.—Vessels with local knowledge can anchor in the eastern part of the Sikeå harbor area, with sternfasts to shore. The depths are $1\frac{3}{4}$ to 4 fathoms, mud.

Vessels with local knowledge can anchor in Lägde Vik, an area westward of Klubben, an islet close westward of Sikeå Light. The area, which is approached southward of Klubben, affords anchorage in depths of $4\frac{1}{2}$ fathoms, mud.

Pilots for Sikeå and Lägde Vik can be obtained at Bredskar (sec. 9A-22) or Gasoren (sec. 10B-21).

Directions.—The entrance to Sikeåfjärden should be approached by steering 297° for Sikeå Light, passing between the spar buoys marking the dangers on either side of the fairway. In a position about 800 yards from Kungsöhallan the range lights should be

picked up and the 336° course they establish followed through the narrow channel to the harbor area.

Ice usually closes the port from the middle of December to the middle of April.

Sikeå is the port for Robertsfors, a town about 3½ miles northwestward of Sikeå. Sikeå is a customs station.

The port has over 1,100 feet of berthing space with depths of 8¼ to 19½ feet along-side; a portion of this space has railroad connections. A quay about 1,300 feet long has depths of 4 to 8 feet alongside. A coal-ing quay eastward of the harbor area is 92 feet long and has a depth of 13 feet at 16 feet off the quay. Small quantities of coal and fuel oil are available. Repairs of limited scope to engines and hulls are undertaken. Tugs are available. Sikeå is in communication by steamer with Stockholm and other Swedish ports.

COASTAL FEATURES (Continued)

10A-8 The coast trends about 10¾ miles north-northeastward from the entrance to Sikeåfjärden to the entrance to Kräkångersfjärden. This section is indented by a considerable number of bights and inlets.

Gumbodafjärden is entered about 4¼ miles northeastward of Sikeåfjärden.

Depths.—The 10-fathom curve lies as far as 2½ to 3 miles off the entrances to the fjords comprising the limits of this section of coast, but elsewhere it is as close as 1½ miles to the coast. Numerous shoals lie inside the 10-fathom curve.

Landmarks.—Ytterklinten, a 574-foot crag about 8 miles west-northwestward of Sikeå, appears of a bluish color from seaward.

Klintsjöberg is a summit about 1½ miles inland in a position about 3¼ miles northward of Sikeå. The summit attains a height of 230 feet and has a steep northern side.

Boberget, which lies about 1 mile north-northeastward of the inner end of Gumbodafjärden, is 190 feet high. The hill has two rocky summits, the western of which is the higher, and is conspicuous from seaward.

Vardstuteberg and Markberg lie 3 and 4 miles, respectively, northeastward of the inner end of Gumbodafjärden, and are 312 feet and 345 feet high. These rocky crests are conspicuous from seaward.

GUMBODAFJÄRDEN AND APPROACHES

10A-9 Gumboda is a loading place within Gumbodafjärden, which has its entrance about 13½ miles north-northeastward of Ratan, and about 4¼ miles northeastward of Sikeåfjärden.

Navigation.—Vessels proceeding to the entrance to Gumbodafjärden from the southward may leave the coastal track at the position about 5¼ miles eastward of Stora Fjäderägg Light (sec. 9C-9), and by steering a course of 000° for a distance of about 17½ miles will arrive at a position from which Hällgrund Beacon (sec. 10A-7) bears 297°. Course may then be shaped for the beacon to a position within 2½ miles of it, where the directions in this section may be followed.

Vessels leaving the entrance to Gumbodafjärden and proceeding eastward and north-eastward to rejoin the coastal track may steer a course of 075° for a distance of 11 miles from a position about 1 mile northward of Vännskär Light. The 075° course leads to a position about 6¾ miles southward of Blackkallen Light, where a course of 037° may be followed a distance of 8½ miles to the position on the coastal track 5¾ miles eastward of the light.

Depths.—The southern approach channel to Gumbodafjärden is available to vessels with a draft of 21 feet; vessels of 16½-foot draft can use the eastern approach channel. In the harbor area within the fjord depths of 1¼ to 3¼ fathoms are available for anchoring. A quay on the western side of the harbor has depths up to 16½ feet alongside.

Islets and dangers in the approach.—Yttre Vännskär is the outermost of a low, barren

group lying southward of the entrance to Gumbodafjärden. Vännskär Light ($64^{\circ}10' N.$, $21^{\circ}08' E.$) is shown on Yttre Vännskär.

On the eastern side of the approach to Gumbodafjärden from the southward is Grallkallen, a shoal over which the depth is $4\frac{1}{4}$ fathoms. The shoal is about $1\frac{1}{2}$ miles south-southwestward of Vännskär Light. Its fairway side is marked by a spar buoy.

Vännskärgrund, on which is a rock above water, is a shoal area on the eastern side of the approach from southward in a position about $\frac{3}{4}$ mile west-southwestward of Vännskär Light. Its fairway side is marked by a spar buoy.

On the western side of the approach from southward is Sacken, a 2-fathom shoal in a position $1\frac{1}{2}$ miles northwestward of Vännskär Light. Its fairway side is marked by a spar buoy.

In the approach to Gumbodafjärden from the northeastern and eastward are the shoals Luvan and Sporren, which lie $1\frac{1}{2}$ and 2 miles north-northeastward, respectively, of Vännskär Light. The depth over Luvan is 5 feet; Sporren is awash. Spar buoys mark their fairway sides.

Numerous small shoals lie in the channel, about 1 mile wide, between the Vännskär group and Högsjär, an islet northward of the group. The approach channel leads between spar buoys marking the fairway sides of the shoals adjacent to the fairway.

Anchorage.—Vessels with local knowledge can anchor in depths of $11\frac{1}{4}$ to $31\frac{1}{4}$ fathoms, ooze, inside of a line joining Granholm, on the eastern side of the fjord, and the southern end of the quay.

Two lighted range beacons at the head of Gumbodafjärden lead through the channel.

Pilots.—Pilots for Gumbodafjärden can be obtained at Bredskar (sec. 9A-22) or Gasoren (sec. 10B-21).

Directions.—Vessels approaching from southeastward and southward should steer 290° for Hällgrund Beacon (sec. 10A-7) to a position within $2\frac{1}{2}$ miles of the beacon. A

course of 000° should then be steered until abeam Stora Vännskär whence the course should be altered slightly to starboard in order to pass eastward of Sacken. When clear of Sacken, a course should be shaped for the entrance to Gumbodafjärden with the lighted range beacons at the head of the fjord in line bearing 357° .

Vessels approaching from the northeastward and eastward should steer for the northern extremity of Stora Vännskär bearing 255° , passing about 600 yards southward of Luvan. When about 1,600 yards from the northern extremity of Stora Vännskär the small islet Vikören, which lies about $1\frac{1}{4}$ miles westward of Högsjär, should be brought in range, bearing 295° , with a conspicuous cleft in the mainland. The channel between Högsjär and the Vännskär group can be followed between spar buoys marking the dangers to a position where the 357° course previously mentioned can be picked up.

Gumboda is a loading place, and has a quay on the western side of the harbor area with a depth of $16\frac{1}{2}$ feet alongside and 312 feet long. Loading is done in the roadstead. Provisions can be obtained from a town about 3 miles distant.

The town is in regular steamer communication with other Swedish coastal ports.

KRÄKÅNGERSFJÄRDEN (LÖVSELEFJÄRDEN)

10A-10 Kräkanger (Lovsele) is a loading place within Kräkångersfjärden, which is entered about 20 miles north-northeastward of Ratan, and about 19 miles southwestward of Bjuröklubb.

Blekeudden is a rocky headland forming the eastern point of the entrance to the fjord. Harrudden, the western point of the entrance, is about 1 mile westward of Blekeudden.

Navigation.—Vessels proceeding to the entrance to Kräkångersfjärden from the southward may leave the coastal track at the po-

sition $5\frac{1}{4}$ miles eastward of Stora Fjäderägg (sec. 9C-9) and steer a course of 004° a distance of about 27 miles to a position about 800 yards westward of the buoy marking Kallen. The directions given in this section may then be followed.

Vessels leaving the entrance to Kräkångersfjärden may rejoin the coastal track by steering a course of 123° for a distance of $1\frac{1}{2}$ miles from a position about 1,300 yards southward of Blekeudden to a position about $6\frac{3}{4}$ miles southwestward of Blackkallen Light. From this position a course of 068° for a distance of about $11\frac{3}{4}$ miles leads to the position on the coastal track (sec. 10A-11) about $5\frac{3}{4}$ miles eastward of Blackkallen Light.

Depths.—The fairway leading through the entrance and up the fjord to the anchorage area will accommodate vessels of 16-foot draft. Depths of $2\frac{3}{4}$ to $4\frac{1}{4}$ fathoms are available for anchoring. The maximum depth alongside a quay is 17 feet.

Entrance—Dangers.—The channel leading up Kräkångersfjärden is about 300 yards wide between Blekeudden and Harrudden.

An approach channel from the southward passes westward of Hällgrund, a rock above water lying about 1 mile southward of Blekeudden. An approach channel from the south-eastward passes northeastward of Hällgrund.

Kallen is a shoal on the eastern side of the channel from the southward. Kallen is awash, and lies in a position about $1\frac{1}{2}$ miles southward of Blekeudden. Its fairway side is marked by a spar buoy.

The approach channel from the southeastward has on its southwestern side a shoal, Synan, over which the depth is 2 fathoms. It lies about $1\frac{1}{4}$ miles south-southeastward of Blekeudden; its fairway side is marked by a spar buoy.

On the northeastern side of the channel is Toppgrund, a shoal lying about 1 mile southeastward of Blekeudden. The depth over

Toppgrund is $3\frac{1}{4}$ fathoms, and its fairway side is marked by a spar buoy.

Various shoal patches near the entrance and within the fjord itself have spar buoys marking their fairway sides.

Range lights.—Lights are shown on the western side of the inner part of Kräkångersfjärden. These lights in range, bearing 339° , lead through the fjord from a position close northward of Hällgrund.

Anchorage.—Vessels with local knowledge can take anchorage in the inner part of Kräkångersfjärden in depths of $2\frac{3}{4}$ to $4\frac{1}{2}$ fathoms, over a bottom of mud.

Pilots.—Pilots for Kräkångersfjärden can be obtained at Bredskar (sec. 9A-22) or Gasoren (sec. 10B-21).

Directions.—Vessels approaching the entrance by way of the channel leading from southward should steer a course of 010° for Blekeudden from a position about 800 yards westward of the buoy marking Kallen. This course passes close eastward of a $4\frac{3}{4}$ -fathom patch westward of Hällgrund, and leads to a position between the buoys marking the entrance to the fjord. The fairway then leads north-northwestward up the fjord between buoys, following the 339° range line.

Vessels approaching the entrance by way of the channel leading from southeastward should steer 303° for Harrudden, passing between the buoys marking Synan and Toppgrund. In a position about 600 yards northward of Hällgrund the range lights should be followed on a course of 339° through the entrance and up the fjord between buoys.

Kräkånger is a loading place. A quay 590 feet long has depths of 17 feet alongside about 330 feet of its length and depths up to 12 feet along the remainder. Kräkånger is in communication by steamer with other Swedish coastal ports.

COASTAL FEATURES (Continued)

10A-11 From the entrance to Kräkångersfjärden the coast trends generally north-

eastward to Bjuröklubb. This section is about 14 miles long, and is very irregular. Kallviken (sec. 10A-12) is a loading place about 4 miles northeastward of Kräkångersfjärden.

Depths—Dangers.—The 5-fathom curve lies as far as $2\frac{1}{2}$ miles south-southeastward off the entrance to Kräkångersfjärden. The buoys marking shoals in the channel leading toward the entrance to the fjord are described in sec. 10A-10.

The 10-fathom curve trends nearly 6 miles southeastward off the entrance to Kräkångersfjärden to enclose Frendins Klackar, the outermost of a number of shoals on the coastal bank. The least depth over Frendins Klackar is $3\frac{3}{4}$ fathoms; this depth is about $4\frac{1}{2}$ miles southward of Kallviksklubben Light.

Trindkallen is a 3-fathom patch lying about 4 miles east-southeastward of Kallviksklubben Light and about the same distance southward of Blackkallen Light. It is the shoalest of a number of patches rising from a detached 10-fathom bank about $5\frac{1}{2}$ miles long in a north-northeast and south-southwest direction. A spar buoy with a radar reflector marks Trindkallen.

Klubben is an islet close offshore in a position about 3 miles east-northeastward of the entrance to Kräkångersfjärden, and southward of the entrance to Kallviken. Kallviksklubben Light is shown on Klubben.

Blackkallen is a rock lying about $1\frac{1}{2}$ miles offshore east-northeastward of the entrance to Kallviken. Blackkallen Light ($64^{\circ}20' N.$, $(21^{\circ}31' E.)$) is shown on the rock. A beacon stands on a rock $1\frac{3}{4}$ miles west-northwestward of Blackkallen.

The 10-fathom curve is about 2 miles off the entrance to Kallviken and from $1\frac{1}{2}$ to 3 miles off Bjurö. About midway along this section it is about 4 miles off. The dangers fronting this section all lie within the 10-fathom curve, and consist of shoals, some of which are marked by spar buoys.

Landmarks.—Vardberget is a bare, conspicuous summit, 150 feet high, standing close to the shore in a position about $2\frac{1}{2}$ miles northeastward of Blekeudden, the eastern point of the entrance to Kräkångersfjärden.

Munkvik Light is shown in a position about $\frac{1}{2}$ mile southeastward of Vardberget.

Viksberget, a narrow rocky ridge 197 feet high, trending in a north and south direction, has two summits about $2\frac{1}{4}$ miles north-northeastward of Vardberget.

Oxberg is a 107-foot hill on the eastern side of the entrance to Kallviken. A beacon on Oxberg consists of a white cairn, 13 feet high, with a red band. Another white cairn beacon, 6 feet high, stands on Kallviksskär, on the western side of the entrance to Kallviken.

Bredberget, a 233-foot summit nearly 2 miles northward of Kallviken, has a steep northern side and a sloping southern side.

Hökmarksberget, about 8 miles west-southwestward of Bjurö, has two summits, 364 and 348 feet high, respectively. The western sides of the summits are steep.

Kulberget is about $3\frac{1}{2}$ miles southwestward of Bjurö. The southwesternmost and highest of several summits of this ridge is 213 feet high.

ANCHORAGES

10A-12 Ratan.—See section 10A-5.

Sikeå.—See section 10A-7.

Gumboda.—See section 10A-9.

Kräkånger.—See section 10A-10.

Kallviken.—The anchorage is within a small fjord about $10\frac{1}{2}$ miles south-southwestward of Bjuröklubb and is accessible to vessels drawing $19\frac{1}{2}$ feet. The space in the harbor area is so small as to admit only a few small vessels. A quay on the eastern side of the harbor area has a depth of 12 feet along-side.

Klubben, the islet southward of the entrance to the fjord, is described in section 10A-11. Läs-kär is an islet westward of Klubben and separated from the mainland by a clear channel about 300 yards wide, with a least depth of about 40 feet.

Kallviken can be approached by passing eastward of Klubben, and also by way of the channel between Läs-kär and the mainland. The fairway sides of the principal shoals and dangers are marked by buoys.

Kallviken is in regular communication by steamer with other Swedish coastal ports.

Pilots can be obtained from Bredskar (sec. 9A-22) or Gasoren (sec. 10B-21).

Part B. BJURÖKLUBB TO RÖNNSKÄR

10B-1 Bjuröklubb ($64^{\circ}29' N.$, $21^{\circ}35' E.$) is a steep point, about 140 feet high, at the northern end of a narrow peninsula extending about $1\frac{1}{2}$ miles north-northwestward from Bjurö. Numerous detached 3- to 26-foot shoal patches lie up to about $2\frac{1}{2}$ miles offshore between northeastward and south-southeastward of the point. A **spar buoy** marks the east-southeastern extremity, and two other **spar buoys** mark the east-northeastern and northern extremities of these dangers. Two $5\frac{1}{4}$ -fathom patches lie about $2\frac{1}{4}$ miles east-northeastward and $\frac{3}{4}$ mile northeastward, respectively, of Bjuröklubb and are about $\frac{1}{2}$ mile outside the buoys. Several **spar buoys** mark a narrow channel with a least depth of $4\frac{1}{2}$ fathoms leading close in-shore through these shoals.

Bjuröklubb Light and **Bjuröklubb Northeast Light** are shown from the point. A radiobeacon is located at Bjuröklubb.



Pilots' houses

BJURÖKLUBB AND BJURÖFJÄRDEN ENTRANCE

Hokmarksberget open northward of Bjuröklubb bearing 249° .

From Swedish Sailing Directions

A lifesaving station with rescue craft and line-throwing apparatus is maintained at Bjuröklubb.

Abnormal magnetic conditions have been reported in the vicinity of Bjuröklubb.

COAST—GENERAL

10B-2 Between Bjuröklubb and Rönnskär, about 33 miles northward, the coast recedes about 11 miles westward, forming an irregular bight which trends about 23 miles north-northwestward to Bergskäret (sec. 10B-21) in the entrance of Kågefjärden, thence about 17½ miles northeastward to Rönnskär. Numerous bays and inlets indent this part of the coast, and there are many small islands close to the shore. The land is fairly low and wooded with some prominent hills a short distance inland. There are several towns and scattered villages with their respective loading places.

Caution.—A semi-circular firing area lies between Rönnskär and a point about 14 miles southwestward and extends offshore for a distance of about 9 miles.

DEPTHS—DANGERS

10B-3 The depths between Bjuröklubb and Rönnskär are very irregular and the dangers steep-to. Most of these dangers are contained within the 10-fathom curve which lies about ½ mile to 6 miles offshore, and there are some detached 5½- to 10-fathom shoals between the 10-fathom curve and the 20-fathom curve, which follows the coastal trend irregularly about 3 to 11 miles offshore. A 3½- and a 4¾-fathom patch lie on a 6½ to 9-fathom bank about 4¼ miles southward of Rönnskär. The dangers inside the 20-fathom curve are described with their related coastal features. Simpgrund (sec. 10C-3) a 3¼-fathom patch about 13½ miles east-southeastward of Rönnskär, and other dangers in the approach to Piteå are described in Part C.

NAVIGATION

10B-4 From a position about 6¾ miles eastward of Bjuröklubb Light vessels may

steer a course of 017° for about 28¼ miles to a position about 17 miles east-southeastward of Rönnskär Light. This track leads over a least depth of 38 fathoms and makes its closest coastal approach at the position eastward of Bjuröklubb.

Vessels bound for ports on this part of the coast may leave the coastal track (sec. 10A-4) at a position about 5¼ miles eastward of Blackkallen Light and steer a course of 000° for about 8¾ miles to a position about 4¼ miles eastward of Bjuröklubb Light. Thence, a direct course may be steered to a position in the approach to a particular destination. Although the channels to the various loading places have ample depths as described herein, most of them are narrow with dangerous shoals in close proximity and require local knowledge; pilots should be used. Pilots can be obtained from Bredskar (sec. 9A-22) or Gasoren (sec. 10B-21).

COASTAL FEATURES—LANDMARKS

10B-5 Bjuröfjärden, a bay about 3¾ miles from north to south, indents the coast about 2½ miles westward between Bjuröklubb and Vånören, an irregular peninsula about 2 miles north-northwestward of Bjuröklubb. Vånören is connected to the mainland by the larger peninsula of Storö, which borders part of the northern end of the bay. The entrance is clear of dangers from close off Bjuröklubb to about 1 mile northward of that point, but thence to Vånören there are numerous shoals and foul ground. Depths vary from 6 to 12½ fathoms in the greater part of this bay, but there are a number of 3½- to 5½-fathom shoal patches in its central part and the northern end as well as the shores of the southern end are encumbered by islets, rocks awash, and 1- to 5-fathom patches, some of which are buoyed. A wreck, marked by a spar with a flag topmark, lies on the eastern side of Gårdfjärden about 1/3 mile south-southwestward of Bjuröklubb Light.

Anchorage may be found in Gårdfjärden, the southeastern part of Bjuröfjärden westward of the Bjuröklubb peninsula, in 5½ to 8 fathoms, sand and clay.

Bäckfors is a loading place in Bäckfjärden, a confined inlet at the northwestern end of Bjuröfjärden and into which a narrow channel, 3.9 m (13 ft.) deep, leads. Two pairs of range beacons mark this channel; the beacons for the outer part of the channel are in range 317°, and those for the inner part are in range 163° astern when entering. A channel for 20-foot drafts leads to an outer anchorage located in Bjurofjarden, off the south-southwestern side of Storo, in 7 to 7.6 m (23 to 25 ft.), mud and gravel. Two mooring dolphins lie in this outer anchorage, about 65 yards off the eastern shore.

A small tug is available and provisions can be obtained.

Directions.—Vessels may approach Bjurofjarden from the southeastward through the inshore channel eastward of the Bjuroklubb peninsula. Vessels approaching from the northeastward should keep Kulberget (sec. 10A-11) open northwestward of Bjuroklubb, bearing 221°. A vessel can then round Bjuroklubb for the anchorage in Gardfjarden, being careful to avoid a 7.3 m (4 fm.) patch about 1/2 mile west-southwestward of Bjuroklubb Light.

Ice is an obstruction to navigation from the end of November to the beginning of May.

10B-6 Between Bjurofjarden and the northern end of Skallo, a low wooded peninsula about 6 miles north-northwestward, the coast trends irregularly in that direction. Detached

8.2 to 9.4 m (4 1/2 to 5 1/4 fm.) patches lie up to about 1 3/4 miles southeastward and eastward of the southeastern end of Vanoren, and thence to the northern end of Skallo the coast is fringed to about 3/4 mile offshore by foul ground. Detached 1.8 to 9.4 m (1 to

5 1/4 fm.) shoal patches lie up to about 1 1/2 miles offshore. Buoys mark a 4.9 m (2 3/4 fm.) patch about 1 mile northeastward of Vanoren, and a 2.1 m (1 1/4 fm.) patch and a 5.8 m (3 1/4 fm.) patch lying about 1 1/4 miles eastward and 3/4 mile northward, respectively, of Skallo.

Grundfjarden, a small inlet with depths of 9.4 to 16.7 m (5 1/4 to 9 1/4 fms.), but with some 6.7 m (3 3/4 fm.) patches in its entrance, lies on the western side of Skallo between it and Korsoren, a small peninsula about 2 miles northwestward.

10B-7 Skotgrunnan, a low sandy islet marked at its northern end by a triangular beacon, point down, lies about 7 miles north-northwestward of Bjuroklubb and about 1 1/4 miles offshore northeastward of the northern end of Skallo. It is steep to on its southwestern side except for a 4.5 m (2 1/2 fm.) and a 8.5 m (4 3/4 fm.) patch within about 800 yards southward of its southern end and a 5.8 m (3 1/4 fm.) patch about 600 yards westward of its northern end. The islet is fringed from east-southeastward through northward to north-northwestward by foul ground and shoal patches which lie up to about 1 1/2 miles offshore. A spar buoy marks the northeasternmost of these dangers. A spar buoy, about 1 3/4 miles north-northeastward of the islet and at the northern extremity of the dangers off it, marks a 9.4 m (5 1/4 fm.) patch about 1/4 mile westward of it.

There is a channel (sec. 10B-22) with a least depth of about 9.4 m (5 1/4 fms.) between Skotgrunnan and Skallo.

10B-8 Skelleftebukten, a bay about 5 miles long from south-southeast to north-northwest and encumbered with islets, rocks

awash, and shoals, indents the coast about $2\frac{1}{2}$ miles westward between Korsören, the small peninsula about $2\frac{1}{2}$ miles northwestward of Skallö, and Skelleftenäset, a large peninsula, the southeastern end of which lies about 5 miles north-northwestward of Korsören. Skellefteälv, the principal river of this part of the coast, discharges into Ursvikfjärden, the northwestern end of the bay. A line of several small connected islands, Kallholmen, Hamnskär and Rönnskär, form a narrow peninsula extending about 2 miles southeastward into the bay. Between this peninsula and Skelleftenäset northward lies Kallholmsviken, a narrow bight of the bay, which with Ursvikfjärden and several loading places forms the harbor area of Skelleftehamn, the port for the town of Skellefteå.

Gåsören ($64^{\circ}40' N.$, $21^{\circ}19' E.$), a small islet at the northeastern end of Skelleftebukten, lies about $1\frac{1}{4}$ miles southeastward of the southeastern point of Skelleftenäset and about $\frac{3}{4}$ mile eastward of Rönnskär. Gåsören Light is exhibited from the islet. A submarine cable extends about $1\frac{1}{4}$ miles south-southwestward from Gåsören Light. Foul ground lies between the islet and Skelleftenäset, and numerous other islets lie to the northward with the easternmost of them, Gråsidan, lying about 1 mile north-eastward of Gåsören. A 5-fathom patch, a $4\frac{1}{4}$ -fathom patch, and a $4\frac{3}{4}$ -fathom patch, about $1\frac{1}{2}$ miles eastward and about 2 and 3 miles east-northeastward, respectively, of the light, lie on the southern and eastern extremity of a number of detached shoal patches eastward and northward of Gåsören. A buoy about $1\frac{1}{4}$ miles eastward of Gåsören marks the southern extremity of these shoals, and another buoy marks the south-southeastern end of the foul ground extending about 300 yards in that direction from the islet.

10B-9 Bureå, a loading place at the southwestern end of Skelleftebukten and about $3\frac{1}{2}$ miles west-northwestward of Kor-

sören, has a small harbor into which a draft of about 16 feet may be taken. There are wharves 820 and 672 feet long with depths of $6\frac{1}{2}$ to $16\frac{1}{2}$ feet alongside. There is a $3\frac{1}{2}$ -ton crane. Tugs are available, and provisions can be obtained. A maximum of 3 tons of fuel oil can be obtained from a tank on the south wharf. There is a doctor in the port. Vessels with local knowledge may find anchorage in about 8 fathoms, mud and stones, near Yxgrund, an islet about $\frac{1}{2}$ mile east-northeastward of the harbor entrance. Vessels with a draft of about 23 feet can be taken in to the anchorage.

Two range lights, exhibited from the northern side of the harbor, in range $275\frac{1}{2}^{\circ}$ lead through a channel with a least depth of about 23 feet to the anchorage. Buoys mark the southernmost of numerous shoals and dangers close northward of this channel. For directions see section 10B-22.

Burvik, a loading place at the head of a small inlet at the southern end of Skelleftebukten and about halfway between Korsören and Bureå, is approached by a channel for 16-foot drafts which requires local knowledge.

SKELLEFTEÅ AND APPROACHES

10B-10 The town of Skellefteå, where the customhouse for this district is located, lies on the northern bank of Skellefteälv about 8 miles northwestward of the port of Skelleftehamn, which lies on the northern side of the river mouth at the northwestern end of Skelleftebukten. Örviken is a loading place on the southwestern side of the river entrance about 1 mile south-southwestward of Skelleftehamn, and Sävenäs and Ursviken (Yttre Ursviken and Inre Ursviken) are loading places close westward and about $1\frac{1}{4}$ miles northwestward, respectively, of the port.

The entrance to Skelleftehamn and the loading places is close southward of Gåsören. Vessels use the facilities in Kallholmsviken, or those of the loading places in the river mouth.

NAVIGATION

10B-11 From a position about $4\frac{1}{4}$ miles eastward of Bjuröklubb Light, vessels may steer a course of 320° for about $4\frac{1}{2}$ miles to a position eastward of the northern end of Vanören, and thence as in the directions (sec. 10B-22), passing inside Skötgrunnan; this approach leads over a least depth of 32 feet to a position about 1 mile southward of Gåsören, and its closest approach to land is about $\frac{1}{4}$ mile southwestward of Skötgrunnan.

Vessels preferring to pass outside Skötgrunnan may steer a course of 329° for about $11\frac{1}{2}$ miles from the position about $4\frac{1}{4}$ miles eastward of Bjuröklubb to a position about $5\frac{1}{4}$ miles east-southeastward of Gåsören; this course leads over a least depth of 11 fathoms and its closest approach to land is about 2 miles east-northeastward of Skötgrunnan.

ICE

10B-12 Skelleftehamn and the landing places in Skelleftebukten are usually closed by ice from the beginning of December to the middle of May.

WATER LEVEL

10B-13 Ordinary low and high water is about $1\frac{1}{2}$ feet above and below mean water, respectively. It usually rises in the fall with southeasterly and southwesterly winds, and falls with northerly and northeasterly winds. Low water usually occurs in the spring and early summer.

CURRENTS

10B-14 With the breaking up of ice in the spring, the outgoing river current runs strongly for about 4 to 6 weeks and may attain a velocity of $1\frac{1}{2}$ to 2 knots at Sävenäs.

DEPTHS

10B-15 Vessels with a draft up to 31 feet can use the southern channel from eastward, and vessels with a draft of less than 16 feet can use the northern channel from eastward. The two channels branch from a point about $3\frac{1}{2}$ miles north-northwest of Skötgrunnan.

Vessels with a draft of 26 feet can use the channel from southeastward between Skötgrunnan and the mainland. Vessels with a draft of 31 feet can enter Kallholmsviken and proceed to the oil pier while those with drafts of 26 feet and 23 feet can proceed, respectively, to Ronnskars and Skelleftehamn. The channel to Sävenäs is available to vessels with a draft of 22 feet; that to Yttre Ursviken is for 22-foot drafts; and that to Inre Ursviken is for 12-foot drafts.

Depths alongside the berths at Skelleftehamn vary from $19\frac{1}{2}$ to 23 feet, and there are depths of 18 to 26 feet alongside at Ronnskär. Depths at the other loading places vary from $8\frac{1}{2}$ to 19 feet.

LANDMARKS

10B-16 Bureäliden, at the southwestern end of Skelleftebukten, is a dark wooded hill about 321 feet high which slopes gently on its southern side but is steeper on the northern and higher side.

Nöppelberget, a bare, light-gray rocky hill about 460 feet high and 11 miles northwestward of Gåsören and $1\frac{1}{2}$ miles north-northeastward of Skellefteå, is conspicuous from southeastward and appears to lie between two lower hills.

An areolight mast, marked by obstruction lights, is located about 1 mile north-westward of Nöppelberget.

Bureå Church, which has a red roof and a black tower surmounted by a spire, and the 476-foot chimney on the northwest point of Rönnskär, as well as those at Örviken and Sävenäs, are conspicuous.

ISLANDS AND DANGERS IN THE APPROACHES

10B-17 Most of the many islets, rocks awash, and dangerous shoals in Skelleftebukten lie westward of **Helmersgrund**, a 3-fathom shoal patch about 2 miles south-southeastward of Gåsören. It is marked on its eastern side by a buoy, and a $5\frac{1}{4}$ -fathom patch lies about $\frac{1}{4}$ mile south-southeastward. **Tellögrund**, a 4-foot shoal patch with a buoy on its southeastern side, lies about 1 mile south-southwestward of **Helmersgrund** at the

southeastern extremity of these dangers, but a $4\frac{1}{4}$ - and a $5\frac{1}{2}$ -fathom shoal patch lie about 1 mile eastward and east-northeastward of Tellögrund. Concordiasgrund, a reef awash about $1\frac{1}{4}$ miles south-southwestward of Gåsören and marked on its northeastern side by a buoy, and Norra Olsgrundet, an islet about $1\frac{1}{4}$ miles west-southwestward of Gåsören, mark the northeastern side of these dangers. A light marks the northern end of foul ground extending about $\frac{1}{4}$ mile northeastward from the islet.

Rakan Light, with a radar reflector, stands about $\frac{1}{4}$ mile northwestward of Concordiasgrund. A fog signal is sounded.

A 2-fathom patch, marked on its southeastern side by a spar buoy with a radar reflector lies about 1 mile eastward of Gåsören Light.

Olsen Light is exhibited at the outer end of a shoal which extends about $\frac{1}{4}$ mile north-northeastward from Norra Olsgrundet, an islet about 1 $\frac{1}{2}$ miles west-southwestward of Gasoren.

Astridsgrund, a $3\frac{1}{4}$ -fathom shoal patch, and Stensgrund, a 3-fathom shoal patch with a $4\frac{3}{4}$ -fathom patch about 350 yards eastward, lie about 1 mile southeastward and $\frac{3}{4}$ mile south-southeastward of Gåsören Light and are each marked on their southern sides by buoys.

Näsgrund, a 1-fathom shoal patch marked on its western and southern sides by buoys, lies about $\frac{1}{2}$ mile westward of Gåsören between that islet and Ronnskar. A light buoy is moored off the southern end of Nasgrund.

Kalkgrund, a wooded islet about $1\frac{1}{4}$ miles northwestward of Norra Olsgrund, has two $3\frac{1}{4}$ -fathom shoal patches about $\frac{1}{2}$ mile east-southeastward and $\frac{1}{4}$ mile eastward of it, and Klackarna, a 3-fathom shoal patch marked on its northeastern side by a buoy, lies about $\frac{1}{4}$ mile northward of the islet.

A detached $4\frac{3}{4}$ -fathom shoal patch lies about 3 miles southeastward of Gåsören Light, and a $5\frac{1}{4}$ -fathom patch and a $4\frac{1}{4}$ -fathom patch lie about $1\frac{1}{4}$ miles east-southeastward and $\frac{1}{2}$ mile southeastward of that light.

A spit with a depth of $4\frac{1}{4}$ fathoms over its outer end extends about $\frac{1}{4}$ mile southward from the southeastern extremity of Ronnskar. A light buoy is moored close southward of the spit.

CHANNELS

10B-18 Two channels lead into Skelleftebukten from the east. The northern channel enters between Astridsgrund and the shoals northward and passes southward of Gåsören while the southern one passes south of Astridsgrund and Stensgrund. The two channels unite at a point about $\frac{1}{2}$ mile eastward of Norra Olsgrundet and thence lead between the buoy northward of that islet and the buoy on the southern side of Rönnskar to the river mouth. A channel from the southeastward passes close northeastward of Helmersgrund and joins the channels from eastward at a position eastward of Norra Olsgrundet.

The channel into Kallholmsviken enters between the buoy on the western side of Nasgrund and the light buoy off the eastern end of Ronnskar, and thence passes southward of the foul ground extending about $\frac{1}{2}$ mile southward from the southeastern end of Skelleftenaset. There is a channel close to shore from Burea to Orsviken and Ursviken, and a small canal with a depth of 8 feet and a width of 33 feet leads between Hamnskar and Kallholmen.

SUBMARINE CABLES

10B-19 Submarine cables are laid between Ronnskar and Gasoren. Anchorage is prohibited within 55 yards of this cable.

Two submarine cables and a pipeline are laid across the Skellefteälv between Savenäs and Ursviken; anchorage is prohibited in their vicinity.

NAVIGATIONAL AIDS

10B-20 In addition to those lights, ranges, and buoys already described there are a number of lighted ranges used in entering. Three light beacons in range 330° are located at Skelleftenåset about $1\frac{3}{4}$ miles northwestward of Gäsören Light and lead into Kallholmsviken; another light is exhibited at the head of this inlet at Skelleftehamn. Lights in range 321° are located about 2 miles northwestward of Gäsören Light and lead alongside a quay on the northern side of Skelleftehamn.

Orviken high Light is exhibited from Orviken, located about 3 miles west-northwestward of Gasören Light. Two low lights in line 296° with the high light, are located $\frac{1}{2}$ mile east-southeastward of the high light.

Range lights, exhibited from the southwestern side of the river entrance about $2\frac{1}{2}$ and $3\frac{1}{4}$ miles northwestward of Norra Olsgrundet, in range 308°, lead to Ursviken.

Range lights, exhibited from the northeastern side of the river about $4\frac{1}{4}$ miles

northwestward of Norra Olsgrundet, are in range 318°.

An aeronautical radiobeacon is located about 6½ miles northwestward of Norra Olsgrundet.

PILOTS

10B-21 Pilots from Skelleftehamn board incoming vessels about 2 miles east-south-eastward of Gasören Light.

DIRECTIONS FOR ENTERING

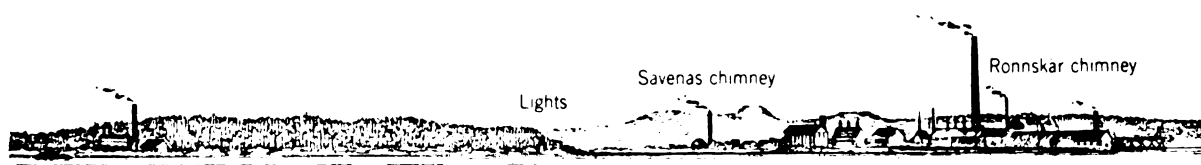
10B-22 Vessels approaching from the southeastward and intending to pass between Skötgrunnan and the mainland steer for the beacon on Skötgrunnan on a course of 315° until about 3 miles from it. When the tallest chimney in Rönnskär is in range with the southwestern point of Skötgrunnan, bearing 308°, steer on that course until clear of Duvan Yttre, the 1¼-fathom patch marked by a buoy about 1¼ miles eastward of Skallö, then bring the Ursviken light structures in line 308° or steer for the Sävenäs sawmill chimney bearing 310° open of the southwestern side of Rönnskär, with Nöppelberget visible behind the sawmill. At night, vessels entering this channel should approach in the southern white sector of Gasören Light on a bearing of 315° until the Ursviken range lights are in line bearing 308°, and thence steer on that course as in the following directions; however, vessels with a draft of more than 15 feet cannot pass over Helmersgrund or Klackarna, over which the Ursviken range leads, and must deviate to the north-eastward from the range line to avoid those shoals.

If bound for Burea, a vessel should pass Skotgronnan on the alignment of Ursviken range lights, which leads northeastward of Disagrund. Course should be altered to bring the range lights at Burea into line bearing 275 1/2°, and steer on that course to the anchorage or harbor entrance.

Vessels proceeding to Skelleftehamn continue on the 310° course for Sävenäs chimney, or on the Ursviken range at night, keeping northeastward of that range in order to clear Helmersgrund. This will lead between Concordiasgrund and Stensgrund, and when the range lights on Skelleftenäset are in line bearing 330° steer on that course into the inlet, and thence follow the buoyed channel. At night, keep on the Skelleftehamn range until the white sector of the light at the head of the inlet bears between 288° and 291°, which sector leads between the dangers to Skelleftehamn.

Vessels bound for Sävenäs or Ursviken, after passing Rakan Light, should steer with Olsen Light ahead, bearing 300°, to pass close southwestward of Ronnklappen light buoy. Course should then be altered to bring Orviken range lights in line 296°, and on this alignment vessels should pass through the narrow channel between Ronnskar and Olsen Light; thence spar buoys mark the channel to the loading places.

Vessels approaching from eastward steer for Gåsören Light on a course of 281°; the tallest chimney in Rönnskär is in line with Gasören Light on this range. When Norra Olsgrundet Light bears 268° steer for it on that course which will lead northward of Astridsgrund and between the buoy on the southern extremity of the foul ground extending from Gasören and Stensgrund. This range leads over a 5 1/4-fathom shoal patch and a 4 1/4-fathom patch about 1 1/4 miles east-southeastward and 1/2 mile southwestward of Gasören Light, but they may be cleared by keeping northward and southward, respectively, of the range line in their vicinity. When the range on Skelleftenäset or the Ursviken range comes into line proceed as previously described. Vessels approaching from eastward and requiring a channel deeper than 16 feet steer for Gasören Light on a course of 281°. When Rakan Light bears about 264°, vessels should steer for it on this heading passing south of Astridsgrund and Stensgrund. When the range on Skelleftenäset



SÄVENÄS CHIMNEY BEARING 310° OPEN SOUTHWARD OF THE SOUTHWESTERN SIDE OF RÖNNSKÄR. From Swedish Sailing Directions

or the Ursviken range come into line, they should proceed as previously described.

SKELLEFTEHAMN

Position: 64°41' N., 21°14' E.

Depths: Channels: to Skelleftehamn, for 23-foot draft; to Rönnskär, for 26-foot draft; to Sävenäs, for 22-foot draft; to Örviken, for 26-foot draft; to Yttre Ursviken, for 22-foot draft; to Inre Ursviken, for 12-foot draft; the channel to the oil pier has a depth of 33 feet.

Anchorage: Kallholmsviken, 19 to 39 feet; Örviken, 5 fathoms; Sävenäs, 17 to 19 feet.

Wharves: Skelleftehamn, 19½ to 23 feet; Rönnskär, 21 to 28 feet; Sävenäs, 19 feet; Örviken, 8½ to 19 feet; Inre Ursviken, 13 feet; Nasudden oil pier, 31-foot draft.

Tidal rise: Negligible.

10B-23 Skelleftehamn, the port for the town of Skellefteå, lies at the head of Kallholmsviken. The harbor area includes the loading places of Rönnskär, Nasudden, Sävenäs, Örviken, and Yttre Ursviken and Inre Ursviken.

Harbor.—The harbor area lies within the limits of Skelleftenäset, Gåsören, Norra Olsgrundet, and Örviken, which embraces Kallholmsviken, Ursviksfjärden, and the entrance of the Skellefteälv.

Anchorage may be found in depths of 23 to 39 feet, mud, near the head of Kallholmsviken, and in depths of 19 to 46 feet northward of Rönnskär. There is sheltered anchorage eastward of the wharves at Örviken in about 5 fathoms, mud and clay, and at Sävenäs in depths of 17 to 19 feet, sand and clay. Anchorage may also be found in other parts of Ursviksfjärden.

10B-24 Skelleftehamn, a town with a population of 3,900, lies at the head of Kallholmsviken. The custom house for Skelleftehamn and the loading places is at Skellefteå, which has a population of about 23,000.

At Skelleftehamn there is a 1,312-foot wharf on the northeastern side of Kallholmen with a depth of

18 to 26 feet alongside. This quay is served by a railroad and has one 4-ton crane. A quay 154 feet long has a depth of 17½ feet alongside.

At Rönnskär the facilities serve the copper-smelting plant and there is a 1,207-foot wharf with depths of about 19 to 27 feet. There are three 6-ton cranes and two 3-ton cranes for handling coal and coke; two electric elevators are available for handling sulphur pyrites. Railroad tracks connect with the system at Skelleftehamn.

A T-head oil pier, 383 feet long across the face, is located on the southwestern side of Nasudden, northward of Rönnskär. The head of this pier, with the use of mooring buoys, can accommodate tankers of about 570 feet in length and a draft of 31 feet. The approach to this pier has a depth of 33 feet. Two tugs are available. Ship's stores and water can be obtained.

Sävenäs, at the northwestern end of Ursviksfjärden and close westward of Skelleftehamn, has a quay 361 feet long with depths of 14½ to 19½ feet alongside. Vessels anchor north of the fairway, with their sterns tied to the shore, in depths of 17½ to 19 feet.

Örviken, about ¾ mile south-southwestward of Sävenäs, has a wharf 754 feet long with depths of 12½ to 16 feet alongside, and other wharves with a total length of 1060 feet and depths of 8½ to 19 feet alongside. There is a 3-ton crane.

Inre Ursviken, about 2¼ miles west-northwestward of Skelleftehamn, has 630 feet of quayage with a depth of 13 feet alongside; it is served by railroad.

Vessels with a draft of 22 feet can anchor and moor with their sterns to a quay at Yttre Ursviken and load from barges.

Tugs are available at these places.

Fuel oil, diesel oil in small quantities, coal, provisions, and water may be obtained at Skelleftehamn and Ursviken, and all except fuel and diesel oil can be obtained at the other loading places.

A small machine shop is located at Ursviken, there is a marine railway for boats at Sävenäs, and small repairs can be made at Örviken.

Skelleftehamn and the loading places are connected with the rest of Sweden by modern telegraph, telephone and radio communications facilities. Skelleftehamn is connected by railroad with Skellefteå and the general railroad system, and there is a good highway and regular bus service between the two towns. There is regular steamship service to Stockholm and other ports.

A hospital is located at Skellefteå.

10B-25 Skellefteå is accessible only to small vessels with a maximum draft of 4 feet.

The town is connected with the Swedish railroad system and it has modern telegraph and telephone communications.

Tugs are available, and fuel oil, water, and provisions can be obtained. Small repairs can be made.

COASTAL FEATURES—LANDMARKS (Continued)

10B-26 Between Gåsören and Kågnäset, a hilly headland about 5 miles northward, the coast is indented about 2 miles westward by Hålfjärden, a bay about 2 miles wide at its entrance and encumbered with islets and foul ground at its southern end, but comparatively free of dangers and with depths of $3\frac{1}{4}$ to 11 fathoms in its northern half.

There is a fishing light with a radar reflector on Kågnäshällan, the southeastern point of Kågnäset. The headland has foul ground fringing it to the eastward, but is steep to on its northern side.

Islets, foul ground, and detached shoals lie up to about $4\frac{1}{2}$ miles offshore along this part of the coast. The southern limits of these lie east-northeastward of Gåsören (sec. 10B-8). Armbågen, a $4\frac{3}{4}$ -fathom shoal patch about 3 miles east-northeastward of Gåsören, Taggen, a $5\frac{1}{4}$ -fathom shoal patch about 4 miles northeastward of Gåsören, and Fördärvet, a $3\frac{1}{4}$ -fathom patch about 3 miles east-northeastward of Kågnäshällan and marked on its northeastern side by a buoy, lie, respectively, at the southeastern, eastern, and northeastern extremities of these dangers. A $4\frac{1}{2}$ -fathom patch lies about $\frac{1}{4}$ mile north-northwestward of Fördärvet.

A $3\frac{3}{4}$ -fathom patch about 2 miles northeastward and another about $1\frac{1}{2}$ miles northward of Kågnäshällan are at the northern extremity of these dangers.

Buoys mark some of the dangers within the above limits.

Between Kågnäset and Osnäsudde, the southeastern point of the large peninsula of Osnäset about $2\frac{1}{2}$ miles northwestward, an irregular bight indents the coast about $1\frac{3}{4}$ miles west-southwestward.

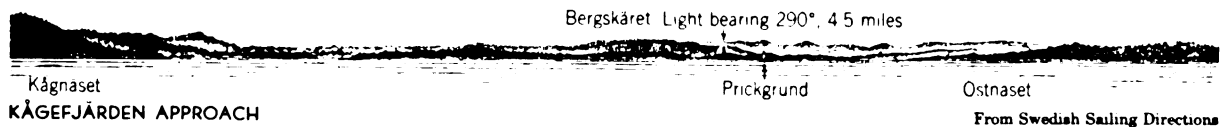
10B-27 Bergskäret ($64^{\circ}48' N., 21^{\circ}07' E.$), a partly wooded islet from which a light is exhibited, lies about 1 mile west-southwestward of Osnäsudde on the southern side of the entrance of Kågefjärden. A beacon, 39 feet high with a square top mark, is located close westward of the light.

Kåge Pickgrund Light is shown from an islet about $\frac{1}{2}$ mile northwestward of Bergskäret.

KÅGEFJÄRDEN AND APPROACHES

10B-28 Kågefjärden, a narrow inlet extending $3\frac{3}{4}$ miles northwestward from Bergskäret, is entered northeastward of that islet and between Osnäsudde and Bodviksö, a point about $1\frac{1}{4}$ miles southwestward of Osnäsudde. Both the inlet and its approaches are encumbered with detached shoals. Numerous $\frac{1}{2}$ - to $3\frac{1}{4}$ -fathom shoal patches lie in the bight southwestward of a line from Bergskäret to Finnhällan, the northeastern point of Kågnäset. A dangerous area with a rock awash and numerous $1\frac{1}{2}$ - to $5\frac{1}{2}$ -fathom shoal patches lies up to about $4\frac{1}{2}$ miles east-southeastward and eastward of Osnäsudde.

A $4\frac{1}{4}$ -fathom shoal patch about $1\frac{1}{2}$ miles east-southeastward of Bergskäret, Svanlacken, a $3\frac{1}{4}$ -fathom patch marked by a buoy, about $2\frac{3}{4}$ miles east-southeastward of Bergskäret, and a 5-fathom patch about $5\frac{1}{4}$ miles east-southeastward of Bergskäret, lie at the southwestern, south-southwestern and southeastern limits of the danger area. A



4¼-fathom patch about 5 miles eastward of Bergskäret and a 4½-fathom patch about 4¼ miles northeastward of that islet lie at the eastern and northeastern extremities of these dangers which lie to the northward of the approach channel.

A buoy marks the southern extremity of the foul ground extending about 600 yards in that direction from Ostrnäsudde, and Karmasgrund, a 1¾-fathom shoal patch marked on its southeastern side by a buoy, lies about 3¼ miles east-northeastward of Bergskäret. Buoys mark some of the other dangers in this area.

A detached 5¼-fathom shoal patch lies about 8½ miles eastward of Bergskäret.

Storkåge, a loading place at the head of Kågefjärden about 3 miles northwestward of Bergskäret, has a quay about 500 feet long with depths of 3 to 13 feet alongside, and another one about 328 feet long with depths of 17 to 19½ feet alongside. A buoyed channel, marked by range beacons in line 290°, leads to the inner quay. There is anchorage in 4½ to 10½ fathoms, mud, north-northeastward of the quays. Small tugs are available, and fuel oil, water, and provisions can be procured. Minor repairs can be effected at a machine shop in the town.

Frostkåge, a loading place in Kågefjärden about 2 miles northward of Storkåge, has a depth of about 9 feet alongside a small quay, and there is anchorage in about 16 feet, mud. Vessels anchor and tie their sterns to posts on the southwestern side of Kattisholm which lies on the northeastern side of the anchorage.

Both loading places have telephone and telegraph communications and bus service with Skellefteå.

Depths.—Vessels with a draft of 23 feet can be taken through either of the approach channels to Kågefjärden and to Storkåge. Vessels with a draft of about 16 feet can be taken to the anchorage at Frostkåge.

Ice usually obstructs navigation from the beginning of December to the middle of May.

Pilots can be obtained from Gasoren. Vessels leaving may obtain them at Skelleftehamn.

10B-29 Directions.—Vessels approaching from the southeastward steer for Bergskäret Light on a course of 290°, which will lead in northward of Fördärvet and southward of the dangers east-southeastward of Ostrnäsudde. Then pass northward around Bergskäret, giving it a berth of 300 yards, and bring the southern point of Bergskäret in range with the northern slope of Finnällan, bearing 123° astern, which will help in passing between Kåge Pickgrund and a 8-foot shoal marked by a buoy about 200 yards south-southwestward, and then proceed through the southwestern part of Kågefjärden to Storkåge. If bound to Frostkåge from about 300 yards northeastward of Bergskäret follow the buoyed channel along the Ostrnäset shore to the anchorage.

Vessels approaching from northeastward steer a course of 235° from a position about 1 mile eastward of Klovaskär, a dark partly wooded islet about 4 miles northeastward of Bergskäret. This course passes about 300 yards southeastward of Karmasgrund and leads through the previously described dangers to a position southward of Ostrnäsudde, from which the above directions may be followed.

COASTAL FEATURES—LANDMARKS (Continued)

10B-30 From Ostrnäsudde the coast, indented by several inlets encumbered by foul ground, trends about 5 miles northeastward to the southeastern end of Romelsö. Dangerous detached shoals (sec. 10B-28) lie up to about 4½ miles offshore to the southeastward and extend about as far northward as Klovaskär (sec. 10B-29). However, inside these dangers, between them and the foul ground fringing the coast up to about ½ mile offshore, there are depths of 5½ to 12 fathoms, and with local knowledge vessels may proceed close inshore. A cluster of 3¼- to 4-fathom shoals about ½ mile long lies about 1¼ miles southwestward of the southeastern end of Romelsö.

Romelsö, a high, wooded island about 6 miles northeastward of Bergskäret, has foul ground, rocks awash, and islets extending up to about $\frac{1}{2}$ mile from its southeastern end and about $\frac{3}{4}$ mile from its eastern and northeastern sides.

A submarine cable is laid from the northwestern extremity of Romelsö to Furuögrund.

Byskefjärden, a bay about 4 miles long from southwest to northeast, indents the coast about $3\frac{1}{2}$ miles westward between Romelsö and Tomsvarten, a point about $5\frac{1}{2}$ miles north-northeastward. This bay is encumbered with shoals, rocks awash, and islets, but there are several buoyed channels leading to Furuögrund, a loading place at the southwestern end of Byskefjärden.

There are several conspicuous buildings and a chimney at Ytterstfors, a settlement on the western side of the bay, and the white tower and spire on Byske Church, northwestward of Ytterstfors, is also a good landmark.

10B-31 Romelsöhallan, a bare rock islet on which is located a 56-foot beacon with a triangular base surmounted by a square board, an upright barrel, and two horizontal barrels, lies about 2 miles north-northeastward of the southeastern end of Romelsö. A 4-fathom shoal patch lies about $\frac{1}{2}$ mile southeastward of the islet with several $4\frac{1}{4}$ -fathom patches between. Several $4\frac{3}{4}$ - to $5\frac{1}{4}$ -fathom patches lie about $\frac{3}{4}$ mile southward, $1\frac{3}{4}$ miles southeastward, and 1 mile east-southeastward of Romelsöhallan, and a $3\frac{1}{4}$ - and a $3\frac{1}{2}$ -fathom shoal patch lie about $\frac{1}{2}$ mile west-southwestward of the islet.

Romelsögrund, a $3\frac{1}{4}$ -fathom shoal patch about $\frac{3}{4}$ mile northward of Romelsöhallan, has a 4-fathom patch about $\frac{1}{2}$ mile east-

ward, and between this shoal and Tomsvarten lie many of the dangers in the entrance of Byskefjärden.

Prickgrund, a shoal patch with a rock awash marked by buoys on its northern and southern sides, lies about $1\frac{1}{4}$ miles west-northwestward of Romelsöhallan, and a $3\frac{1}{2}$ -fathom shoal patch lies about $\frac{1}{4}$ mile west-northwestward of this rock.

Furuögrund, an islet surrounded by foul ground the southeastern end of which is marked by a buoy, lies about $1\frac{3}{4}$ miles west-northwestward of Romelsöhallan, and two buoys about $\frac{1}{4}$ mile off the south-southwestern side of the islet mark the southern side of several rocks awash.

Two buoys mark the northeastern sides of Gubbgrund and Gossgrund, two shoal patches with rocks awash, lying on the northeastern side of the foul ground extending in that direction from Romelsö. A $3\frac{1}{4}$ -fathom patch lies close northward of Gubbgrund, between it and Prickgrund, about $\frac{1}{4}$ mile northward.

10B-32 Furuögrund ($64^{\circ}55' N.$, $21^{\circ}14' E.$), a loading place at the southwestern end of Byskefjärden, has a 656-foot quay with depths of 5 to 13 feet alongside, and a steamship wharf with depths of 6 to 13 feet alongside. There are depths of $4\frac{1}{4}$ to 5 fathoms, sand and mud, in the anchorage. Provisions and water can be obtained. Minor repairs can be made. Range lights are shown on the northern side of the loading place.

Vessels with a draft of 25 feet can be taken in through the channel which enters between Hamnskär and Romelsöhallan, passing between Gubbgrund and Prickgrund, and



BYSCKE CHURCH IN RANGE 320° , WITH FURUÖGRUND ISLET 3.5 MILES.

From Swedish Sailing Directions

thence along the north-northeastern side of Romelsö to Furuögrund. Those with a draft of 22 feet can enter in the channel between Romelsöhallan and Romelsögrund, pass northward of Prickgrund and then join the above channel.

Water level.—Ordinary low water is about $3\frac{1}{2}$ feet below mean water level and is caused by northeasterly winds. Strong southerly winds cause high water.

Ice obstructs navigation from the end of November to the middle of May.

Directions.—Vessels approaching from the southeastward steer a course of 340° for Romelsöhallan Beacon until about $2\frac{1}{2}$ miles from it, then steer a course of 320° which passes about $\frac{1}{4}$ mile northeastward of Hamnskär. When about $\frac{1}{2}$ mile southeastward of that islet bring the islet of Furuögrund in range with Byske Church, bearing 320° , and steer on that range until after passing Gubbgrund. When the range lights at Furuögrund are in range 293° , steer on that range following the buoyed channel into the harbor.

Vessels may approach from the east-southeastward keeping the range lights at Furuögrund in line bearing 293° , being careful to clear the shoals southeastward of Romelsöhallan, and when northward of Gubbgrund proceed as above.

Vessels may also pass northward of Romelsöhallan, and thence steer northward or southward of Furuögrund.

10B-33 Between Tomsvarten and Rönnskär, about $6\frac{1}{2}$ miles northeastward, the irregular coast is indented about $2\frac{1}{4}$ miles northwestward by a bight embracing Tomefjärden in the southwestern part and Åbyfjärden in the northeastern part. Several small islands and shoals about $1\frac{1}{2}$ miles north-northeastward and $1\frac{3}{4}$ miles north-

ward of the southeastern end of Tomsvarten separate the two parts of the bight, which is encumbered with shoals. A channel leads to the loading place of Brännfors at the mouth of the Åbyälv, a river emptying into the head of Åbyfjärden.

This part of the coast is fringed by foul ground extending from about 200 yards to $\frac{3}{4}$ mile offshore, and there are numerous $1\frac{1}{4}$ - to $5\frac{1}{4}$ -fathom shoal patches lying up to about 4 miles offshore. Although there are depths of 6 fathoms and greater inside these dangers, many of the shoals are unmarked, and vessels without local knowledge should keep well off them.

Tomhällan, an islet with foul ground and rocks awash extending about $\frac{1}{4}$ mile northeastward from it, lies about $\frac{1}{2}$ mile south-southeastward of the southeastern point of Tomsvarten.

Selaxgrund, a $4\frac{3}{4}$ -fathom shoal patch lies about $3\frac{3}{4}$ miles eastward of Tomsvarten and about $4\frac{1}{2}$ miles southward of Rönnskär. This shoal is at the southern and southeastern limits of the dangers off this part of the coast. A $4\frac{3}{4}$ -fathom shoal patch about $1\frac{3}{4}$ miles north-northeastward of Selaxgrund lies on the eastern extremity of these dangers, and their northeastern extremity is marked by a spar buoy close northward of a $3\frac{3}{4}$ -fathom shoal patch about 3 miles northward of Selaxgrund and about 1 mile offshore. A detached $4\frac{3}{4}$ -fathom shoal patch lies about $\frac{1}{2}$ mile northward of this buoy.

Bromsgrund, a $3\frac{3}{4}$ -fathom shoal patch, and **Avagrund**, a $1\frac{1}{4}$ -fathom shoal patch, lie about $1\frac{1}{4}$ miles westward and $1\frac{3}{4}$ miles west-northwestward, respectively, of Selaxgrund. A buoy marks the eastern side of Avagrund.

Timarksgrund, an islet on which there is a white beacon about 15 feet high, lies about 3 miles north-northeastward of Tomsvarten,

and several buoys mark shoals off its western side.

Nygrån, Simpgrund, and other dangers east-southeastward of Rönnskär are described in Part C.

10B-34 Brännfors, a loading place at the head of Åbyfjärden, has a quay, in very poor condition, with depths of 2.7 m (9 ft.) to 3.4 m (11 1/2 ft.) alongside. There is a confined anchorage in 5.5 (3 fm.) to 12.8 (7 fm.) meters, stones and mud, the outer part of which is exposed to southeasterly winds. Vessels with a draft of about 24 feet can be taken through the entrance channel to the anchorage. Tugs are available, and small quantities of provisions and water can be obtained. Ice obstructs navigation from the middle of November to the middle of May. Pilots may be obtained from Gasoren (sec. 10B-21). There is a postoffice and telegraph station in Brännfors.

Range lights are exhibited from the northern bank of the river mouth opposite the loading place.

Directions.—Approach Åbyfjärden to a position about 5 miles east-southeastward of Tomsvarten, and bring the beacon on Timarksgrund to bear 325°. Steer for the beacon on that course which will lead between Selaxgrund and Bromsgrund. When the Brännfors range lights are in range 318° steer on that course passing northward of Avagrund to the anchorage.

ANCHORAGES

10B-35 Gärdfjärden.—See section 10B-5.

Bjuröfjärden.—See section 10B-5.

Bureå.—See section 10B-9.

Skelleftehamn.—See section 10B-23.

Storkåge.—See section 10B-28.

Frostkåge.—See section 10B-28.

Furuögrund.—See section 10B-32.

Brännfors.—See section 10B-34.

Part C. RÖNNSKÄR TO HERTSÖ

10C-1 Rönnskär (65°02' N., 21°34' E.), an island lying about 3 miles northeastward of the beacon on Timarksgrund (sec. 10B-33), is wooded except at its southeastern end.

A beacon stands on the southeastern point of Rönnskär and near the beacon is a chapel.

Rönnskär Light is shown near the southeastern end of the island; an auxiliary light is shown and a radiobeacon transmits from the same structure.

COAST—GENERAL

10C-2 Between Rönnskär and Hertsö, a peninsula lying about 36 3/4 miles northeastward, the coast is very irregular. It is mostly wooded and is backed by several conspicuous hills visible from the approaches to Piteå and Luleå, with which they are described.

Numerous islands, islets, and dangers front the coast to a considerable distance offshore, the outermost danger lying about 19 miles seaward of the outer islets. A number of channels among the islands lead to the ports of Piteå and Luleå which are situated, respectively, in the estuaries of Piteälv and Luleälv.

The water in the northern part of Botten-viken is discolored and almost fresh because of the numerous rivers discharging into this portion of the gulf.

Caution.—Parts of the coast and some areas off the coast are incompletely surveyed. Abnormal magnetic conditions are found in the approaches to Piteå and the southern approach to Luleå.

DEPTHS—OFF-LYING DANGERS

10C-3 Depths off the coast and among the islands are very irregular, and give little indication of the approach to dangers.

Simpgrund, a 6.7 (3 3/4 fm.) meter patch marked on its eastern and western sides by spar buoys, lies about 13 1/4 miles east-southeastward of Rönnskär Light.

A 12.7 (6 3/4 fm.) meter patch, marked on its eastern side by a spar buoy, lies about 16 1/4 miles eastward of Rönnskär Light.

Falkensgrund, a 9.1 (5 fm.) meter patch marked by a lighted whistle buoy equipped with a radar reflector, lies about 20 miles south-southeastward of Rodkallen Light (sec. 10C-23).

Svalans Grund, a 7.3 meter (4 fm.) patch, marked on its southeastern side by a spar buoy, lies about 15 1/2 miles south-southeastward of Rodkallen Light.

Norstromsgrund, a large shoal marked on its northwestern, western and southeastern sides by spar buoys, has a least depth of 1.8 m (6 ft.) in a position about 8 1/2 miles southward of Rodkallen Light. A lighted buoy and a lighted whistle buoy, moored about 8 miles south-southwestward of Rodkallen Light, mark the channel between Norstromsgrund and Abelsgrund. (See section 10C-24).

Norstromsgrund Light Vessel is moored almost 3 miles south-southwestward of the shoalest part of Norstromsgrund and about 11 miles southward of Rodkallen Light. A fog signal is sounded.

Grytet, a 6.4 meter (3 1/2 fm.) patch, lies about 11 1/2 miles southward of Rodkallen Light. Depths of 6.4 m (3 1/2 fms.) were reported (1964) close eastward of Grytet.

Edvardsklack, a 4.6 meter (2 1/2 fm.) patch, lies on the southeastern side of a group of dangers about 7 1/2 miles south-eastward of Rodkallen Light. It is marked on its southeastern side by a spar buoy. Edvardsgrund, with a least depth of 2 m (6 ft.) and Marakallen, awash, lie, respectively, about 4 miles southeastward and 6 miles east-southeastward of the same light. A number of patches with depths of 11 m (6 fms.) or less lie in the vicinity of these three dangers.

Farstugrunden, a group of shoal patches with a least depth of 7.6 m (4 1/4 fms.), lies about 8 1/2 miles eastward of Rodkallen Light. A lighted whistle buoy is moored close eastward of a 10 meter (5 1/2 fm.) patch which lies about 1 mile east-northeastward of the northern end of Farstugrunden. A spar buoy with a topmark of 2 balls is moored off the northern edge of the patch. Ytterhosen, a 9.1 m (5 fm.) patch marked by a spar buoy, lies southward of Farstugrunden and about 9 1/4 miles eastward of Rodkallen Light.

Dangers adjacent to the channels in the approaches to Pitea and Lulea are described with the related features.

NAVIGATION

10C-4 From a position about 17 miles miles east-southeastward of Rönnskär Light,

vessels may steer a course of 044° for about 48 miles to a position about 2 miles southwestward of the western end of Mälören (sec. 10D-3). This track leads over a least depth of 11.9 m (6 1/2 fms.) and passes about 3 miles southeastward of Simpgrund, 5 1/2 miles southeastward of Norstromsgrund Light Vessel, 2 3/4 miles southeastward of an 8.5 m (4 3/4 fm.) patch at the southeastern extremity of Norstromsgrund, and 1 3/4 miles northwestward of Svalansgrund.

APPROACHES TO PITEÅ

LANDMARKS

10C-5 Kälén, a wooded hill with gradual slopes, rises to a height of 420 feet about 6 miles northwestward of Rönnskär Light. In clear weather it is visible at a distance of about 24 miles and is the best distant landmark for approaching Piteå. Högberget, about 1 3/4 miles northeastward of Kälén, is 279 feet high. It is not as thickly wooded as Kälén and appears to have two or three separate summits when seen from different directions. Degerberget, on the eastern side of Pitholm (sec. 10C-10) and about 15 miles northward of Rönnskär, is 262 feet high. It has two summits and has a steeper slope toward the north than toward the south.

NAVIGATION

10C-6 Vessels bound for Piteå from southward may leave the coastal track (sec. 10A-4) at a position about 5 3/4 miles eastward of Blackhallen Light (sec. 10A-11) and steer a course of 355° for about 31 miles to a position about 3 1/4 miles southeastward of Rönnskär Light. This track makes its closest coastal approach off Rönnskär, clears all dangers, and leads over depths of more than 18.3 m (10 fms.).

Vessels approaching from northeastward may leave the coastal track (sec. 10C-4) at

a position about 6 miles south-southeastward of Norströmsgrund Light Vessel and steer a course of 260° for about $16\frac{1}{2}$ miles to a position about $6\frac{1}{2}$ miles east-southeastward of Rönnskär Light. This track clears all dangers and leads over a least charted depth of $15\frac{3}{4}$ fathoms.

WATER LEVEL

10C-7 The water level may vary from 3 feet below mean level to 3 feet above. Northerly winds cause low water and southerly winds cause high water.

ICE

10C-8 The harbors and loading places in the approach to Piteå are usually closed to navigation by ice from the middle of November to the beginning of May; they may, however, be kept open by ice breakers until the middle of December.

CHANNEL—ISLANDS AND DANGERS

10C-9 Four channels lead from seaward to Pitsundet, a narrow passage entered about $11\frac{1}{2}$ miles northward of Rönnskär Light. From the northern end of Pitsundet a channel leads through Yttre Pitfjärden and into Inre Pitfjärden. At the southern end of the latter an island divides the channel into two parts of which the eastern is Munksundet and the western is Djupsundet. Piteå is located on the northeastern side of Inre Pitfjärden, and there are loading places in Yttre and Inre Pitfjärden.

Channels eastward of Rönnskär.—Channels of approach to Pitsundet for vessels of $19\frac{1}{2}$ -foot draft pass westward and eastward of Hesledensgrund, an 8-foot patch lying about $1\frac{1}{2}$ miles southeastward of Rönnskär Light and marked on its western side by a spar

buoy with a radar reflector. Hattgrund, a $1\frac{1}{2}$ -fathom patch, and Olnilsgrund, a 7-foot patch, lie on the western side of the western channel, about $\frac{1}{2}$ mile southeastward and east-northeastward, respectively, of Rönnskär Light; both these dangers are marked on their eastern sides by spar buoys. Several unmarked shoal patches lie northward and north-northeastward of Olnilsgrund.

Sandön, an island on the western side of the fairway, lies about 3 miles northward of Rönnskär Light. Geten and Getbådan, two patches with depths of 5 feet and 2 fathoms, respectively, lie about $\frac{3}{4}$ mile southeastward of the southeastern point of Sandön. The tracks leading northward from the western and eastern sides of Hesledensgrund join between Geten and Getbådan, which are marked by spar buoys on the sides toward the channel.

Västra Leskär and Östra Leskär are two wooded islets lying close together, about 2 miles north-northeastward of Sandön. A white beacon, consisting of a pole with supports covered with boards and surmounted by a horizontal cask, stands on Västra Leskär.

Leskär Light ($65^{\circ}08' N.$, $21^{\circ}38' E.$) is shown from Östra Leskär.

A channel for vessels of $32\frac{1}{2}$ -foot draft passes eastward of Leskär Light and one for vessels of 23-foot draft passes westward of Västra Leskär.

Jävreholmen (Jäfreholm) is a wooded island lying about $2\frac{1}{2}$ miles northeastward of Sandön. A beacon stands on the western side of the island; a light beacon stands on the northern end of the island. Stenskär, a barren, sandy island, lies about $\frac{1}{2}$ mile southeastward of Jävreholmen and is separated from it by shoal water.

Isaksgrund, a shoal patch marked by a spar buoy on its southwestern side, lies about

1 3/4 miles northward of the beacon on Vastra Leskar. A 5.8 m (3 1/4 fm.) patch lies very close to the fairway about 3 1/2 miles north-northwestward of Ostra Leskar. Renoragrun-det Light, equipped with a radar reflector, marks this danger. A fog signal is sounded. Other shoal patches, marked by spar buoys in accordance with the uniform system, lie in or near the fairway from Isaksgrund to the entrance of Pitsundet.

Tallskär, the southernmost of four islets fronting the entrance of Pitsundet, lies on the eastern side of the channel, about 3 1/2 miles north-northwestward of Jävreholmen. Huvan (Hufvan), the northern islet of the group, lies about 1 1/4 miles north-northwestward of Tallskär.

A light is shown on the northern end of Tallskär.

Nygrån, on the eastern side of the channel entered eastward of Hesledensgrund, is a 2.7 m (1 1/2 fm.) patch lying about 3 1/2 miles east-southeastward of Ronnskar Light. Nygran Light with a radar reflector stands near Nygran. A fog signal is sounded from the light structure. A 4.5 m (2 1/2 fm.) patch lies about 1/2 mile northwestward of Nygran. Anchorage is prohibited within 550 yards of a submarine cable which extends from Nygran Light to Ronnskar. Finngrund, a 3.9 m (2 1/4 fm.) patch marked by a spar buoy on its eastern side, lies about 2 3/4 miles eastward of Ronnskar Light; a stranded wreck lies on the eastern side of Finngrund. Several other shoal patches, some of which are marked by buoys in accordance with the uniform system, lie on the eastern side of the channel between Finngrund and Getbaden. A 9.4 m (5 1/4 fm.) patch and a 7.6 (4 1/2 fm.) patch lie in the middle of the fairway, about 2 miles east-northeastward and 2 1/2 miles northeastward, respectively, of Ronnskar Light.

10C-10 Channel eastward of Nygrån.—

A channel of approach to Pitsundet for vessels of 32 1/2-foot draft passes eastward of Nygrån and the dangers north-northwestward of it. Between Ostra Leskär and Jävreholmen this approach joins the one leading northward from the channel between Geten and Getbådan. Some rocks above water lie on a shoal area extending about 2 miles southward from Stenskar. A 4.9 m (2 3/4 fm.) patch at the southern end of this area is marked on its western side by a spar buoy. Ruskbadan, a 3.9 m (2 1/4 fm.) patch marked on its western side by a spar buoy, lies about 2 1/4 miles southeastward of Leskar Light.

A channel, authorized for a draft of 37 1/2 feet, branches from the channel eastward of Nygrån 1/2 mile south-southeastward of Renoragrun-det, and marked by leading light beacons and buoys, leads northeastward to the Sor-Haraholmen oil wharf situated at the northwestern end of Bondon.

Channel westward of Klockgrund.—The channel, entered to the westward of Klockgrund, extending in a general northwestward direction between Ostan, Stoppgrundet, Stenskargrundet and 'Bondokallarne has been discontinued (1967). Buoys marking the former fairway have been withdrawn.

A light is shown from a white triangular daymark, point up, on Lillhörön, an islet lying about 1 mile northeastward of the lighted beacon on Jävreholmen. These two light structures are in range about 238 1/2° and lead through a narrow buoyed channel which passes through Degerstensgrund.

Sandskär, an islet lying about 1 mile north-westward of Lillhörön, has a yellow beach, a

hillock in the middle, and some trees on its northern part. **Sandskär Beacon** is a white cairn standing on a rock close northward of Sandskär. An 8-foot patch marked on its northern side by a **spar buoy** lies about $\frac{1}{2}$ mile westward of Sandskär Beacon. Larsgrund, with a depth of 3 fathoms, and Eriksgrund, awash, lie, respectively, about $\frac{1}{4}$ mile northward and $\frac{3}{4}$ mile north-northwestward of Sandskär Beacon; both are marked by **spar buoys**. A $3\frac{1}{4}$ -fathom patch marked on its southern side by a **spar buoy** lies about 800 yards southward of Tallskär.

Pitsundet is the narrow passage between the mainland and the southwestern end of Pitholm, a large island lying close to the mainland. Yttre Pitfjärden, Munksundet, and Inre Pitfjärden also border Pitholm on its western side. The channel through Pitsundet has a depth of $29\frac{1}{2}$ feet and a bottom width of 164 feet. The southeastern entrance of the sound is protected by two breakwaters. The heads of the breakwaters are marked by **beacons**, and two **spar buoys** are moored about $\frac{1}{4}$ mile southeastward of the head of the northern breakwater to mark the sides of the approaching channel. The channel in Pitsundet is marked by **spar buoys** in accordance with the uniform system and by **range lights**. A submarine cable crosses the channel near the middle of the sound; anchorage is prohibited within 55 yards of the cable.

Munksundet and Djupsundet.—At the northern end of Yttre Pitfjärden, which extends about $2\frac{3}{4}$ miles north-northwestward from the northern end of Pitsundet, the channel becomes narrow and is divided into two parts by Fingermansholmen, an islet at the southern end of Inre Pitfjärden. Munksundet, passing eastward of Fingermansholmen, has a depth of 19 feet and a bottom width of 98 feet. Djupsundet, passing southwestward of the islet, has a depth of 13 feet. **Range lights** lead through Munksundet, and both

channels are marked by **spar buoys**. An overhead cable transporter crosses Munksundet at a least height of 124 feet and extends from Fingermansholmen to the mainland west-northwestward.

Current from Piteälv sets through Pitsundet, Munksundet, and Djupsundet, attaining at times, during spring and early summer, a velocity of 2 to 3 knots.

Traffic regulations are in force in the dredged channels from the southeastern entrance of Pitsundet to Piteå. **Traffic signals** are shown from the southwestern side of Pitsundet.

ANCHORAGES

10C-11 Kinnbäcksfjärden, west-northwestward of Rönnskär, affords sheltered anchorage in depths of $3\frac{1}{4}$ to $6\frac{1}{2}$ fathoms, sand and mud. The entrance channel has a least depth of about 13 feet. A white triangular beacon, point up, stands on Krabbgrund, an islet lying close northeastward of the northern point of Rönnskär, and a white triangular beacon, point down, stands on Lonngrund, a small islet close northeastward of Krabbgrund. These two beacons in range astern lead through the entrance of Kinnbäcksfjärden.

Jävrefjärden (Jäfrefjärden), north-northwestward of Sandön, affords anchorage in depths of $7\frac{1}{2}$ to $10\frac{1}{4}$ fathoms, mud. This anchorage is open to winds from between south and east.

Huvan Anchorage, between Huvan and the entrance of Pitsundet, has depths of $4\frac{3}{4}$ to 6 fathoms, mud. Deep-draft vessels can complete loading in this anchorage, but southerly winds raise some sea.

PILOTS

10C-12 Pilots for Piteå, and for the anchorages and loading places in its vicinity,

can be obtained from Gasoren pilot station (sec. 10B-21). For general information regarding pilotage in Swedish waters, see section 1-25.

A lifesaving station with rescue craft and line-throwing apparatus is maintained at Rönnskär.

DIRECTIONS

10C-13 Approaching the entrance of the channel leading westward of Hesledensgrund, steer for Rönnskär Light in range 327° with Kälen (sec. 10C-5). When about $1\frac{1}{2}$ miles from the lighthouse steer 005° for the beacon on Västra Lenskär close eastward of the eastern side of Sandön. This course leads between Hesledensgrund and a 4-fathom patch lying about 1 mile southeastward of Rönnskär Light; while passing these dangers course should be altered somewhat eastward. When Rönnskär Light is abeam steer about 018° toward Jävreholmen. This course leads eastward of Olnilsgrund and of two patches with depths of $3\frac{1}{4}$ and $4\frac{3}{4}$ fathoms, lying about $1\frac{1}{2}$ and 2 miles, respectively, northeastward of Rönnskär Light, and westward of a $4\frac{1}{2}$ -fathom patch lying about 2 miles northeastward of the same light. The beacons on Jävreholmen in range 010° lead between Geten and Getbådan, passing very close westward of a $4\frac{1}{4}$ -fathom patch lying close northward of the passage. Having passed these dangers, steer to pass about midway between Leskär Light and Jävreholmen. When Leskär Light is abeam steer about 327° until the beacon on Lillhörön bears about 087° , thence steer about 344° , passing westward of Isaksgrund and close eastward of a $3\frac{1}{4}$ -fathom patch marked by Renora-grundet Light, lying about $\frac{3}{4}$ mile south-southwestward of Tallskär. After passing between Tallskär and Carolusgrund, a 4-

foot patch marked on its eastern side by a spar buoy, lying about $\frac{1}{2}$ mile westward of Tallskär, proceed to the anchorage westward of Huvan or to the entrance of Pitsundet.

If bound for Kinnbäcksfjärden, pass between Hesledensgrund and the 4-fathom

patch westward of it as previously directed, thence steer northwestward, passing northeastward of Hattgrund, between Rönnskär and Olnilsgrund, and between the northern end of Rönnskär and Krabbgrund. After rounding the northern end of Rönnskär at a distance of about 200 yards, steer through the narrow passage on the northwestern side of the island, keeping the beacons on Krabbgrund and Lonnggrund in range 063° astern, and, having passed close southward of a spar buoy, proceed to the anchorage.

Approaching the entrance of the channel leading eastward of Hesledensgrund and having arrived at a position about 3 miles southeastward of Rönnskär Light, steer for Leskär Light on a course of 359° . This course passes very close westward of two patches with depths of $5\frac{1}{4}$ and $4\frac{1}{4}$ fathoms, lying about 2 miles east-northeastward and $2\frac{1}{2}$ miles northeastward, respectively, of Rönnskär Light, and leads between Geten and Getbådan, where the channels from the western and eastern sides of Hesledensgrund unite.

If using the channel eastward of Nygrån, steer for Leskär light in range 339° with a chimney at Skuthamn, passing west-southwestward of the shoal area extending southward from Stenskär. When about $\frac{3}{4}$ mile from the light, steer to pass midway between it and Jävreholmen, and proceed as previously directed.

At night, vessels can use the channels eastward of Hesledensgrund and eastward of Nygrån, keeping with the white sectors of Leskär Light. The channel northward from Leskär Light to Huvan Anchorage is indicated by the white sectors of Renörgrundet Light. When passing from the southern sector, vessels should pass close eastward of the light.

LOADING PLACES

10C-14 Skuthamn and Munksund are adjoining loading places on the eastern side of Yttre Pitfjärden, Munksund lying at the southern entrance of Munksundet. There is anchorage off Skuthamn in depths of $3\frac{3}{4}$ to $4\frac{3}{4}$ fathoms and off Munksund in depths of $3\frac{1}{2}$ to $4\frac{1}{4}$ fathoms, with mud bottom at both anchorages. Vessels of 26-foot draft can reach these anchorages from Pitsundet.

In Skuthamn, the wharf at the bulk warehouse is 984 feet long with $14\frac{1}{2}$ to 26 feet alongside; Limestone Wharf is 295 feet long with 17 to 22 feet about 10 feet off the face of the dock; at the Lumberyard wharf, vessels anchor in $15\frac{3}{4}$ to $19\frac{1}{2}$ feet about 328 feet off and moor their sterns to the dock. The wharf at the bulk warehouse has facilities for the discharge of oil; a $2\frac{1}{2}$ - and a 5-ton crane are available. A 3-ton crane is available at Limestone Wharf.

In Munksund, the Lumberyard wharf is 820 feet long with 13 to $14\frac{3}{4}$ feet alongside; vessels can anchor in $16\frac{1}{2}$ feet about 328 feet off and moor their sterns to the wharf, Steamboat wharf is 361 feet long with $10\frac{3}{4}$ to 13 feet alongside.

Tugs are available. Provisions can be obtained. Water is supplied by water boat. Minor repairs can be made.

Tingsholmen, on the western side of Inre Pitfjärden, has an anchorage with a depth of

about 5 fathoms, mud. There is a quay 328 feet long, with a depth of 17 feet alongside.

Storfors, about $\frac{3}{4}$ mile northwestward of Tingsholmen, has an anchorage with depths of $4\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, mud. Vessels of 17-foot draft can proceed from Munksundet to the anchorage, at which stern moorings are used. There is about 1,312 feet of quayage with depths of 15 to 17 feet alongside. This loading place has been abandoned.

Lövholmen, on a peninsula of the same name on the eastern side of Inre Pitfjärden, has an anchorage with a depth of about 3 fathoms, ooze. Vessels at anchor use stern moorings. There are 820 feet of quayage with depths of $17\frac{3}{4}$ and $19\frac{1}{2}$ feet alongside and 2,461 feet of quayage with $6\frac{1}{2}$ and 13 feet alongside. Two tugs are available.

PITEÅ

Position: $65^{\circ}19' N.$, $21^{\circ}29' E.$

Depths: Stadsrännan, 17 feet.
Södra Hamnen, off quays, 17 feet.
Berths, 18 $\frac{1}{3}$ feet.

Tidal rise: Negligible.

10C-15 Piteå is a small port on the northeastern side of Inre Pitfjärden. It consists of two harbors, Södra and Norra Hamnen, which are connected by a narrow passage. Norra Hamnen is available only to small craft.

Navigation.—See section 10C-6.

Depths.—The least depth in the channels leading from seaward to the quays at Piteå (entering Inre Pitfjärden through Munksundet) is 17 feet in Stadsrännan, the channel subject to silting through Inre Pitfjärden to the head of Södra Hamnen. That part of the harbor adjacent to the quays has a depth of 18 $\frac{1}{3}$ feet.

Harbor.—Stadsrännan leads into Södra Hamnen around Lövholmen. The channel has

a bottom width of 164 feet and is marked by **buoys and range lights**. With the exception of Stadsrännan and an area off the quays, the harbor is shallow. Strömsundet, the channel connecting Södra and Norra Hamnen, has a depth of 6 feet. A **submarine cable** is laid across the entrance of Södra Hamnen. Anchoring is prohibited within about 30 yards of the cable. An **overhead cable transporter** crosses Stadsrännan at a least height of 105 feet. A **water level gage** in the harbor indicates the water level at Munksundet and Piteå.

Pilots.—See section 10C-12.

Directions.—See section 10C-13.

10C-16 Piteå, on the northeastern side of Södra Hamnen, has a population of about 7,500. There is a customhouse in the town. The principal exports are timber, pit props, lumber, and paper pulp. Coal, salt, sugar, coffee, and fertilizer are imported. There is 1,778 feet of quayage with a depth of about 18 1/3 feet alongside. Vessels use their own winches for working cargo. The quays are connected to the general railroad system. Tugs are available. Provisions and small quantities of coal and fuel oil can be obtained. Water is supplied by water boat. There is a machine shop for small repairs. Regular steamer service is maintained with Stockholm and other Swedish ports. A hospital is available.

INNER CHANNELS BETWEEN PITEÅ AND LULEÅ—ANCHORAGE

10C-17 Vessels with local knowledge can proceed from Piteå to Luleå through an inner channel among the islands and dangers fronting the coast. This channel has a least depth of 14 1/2 feet and is marked by **buoys and beacons**. From the approaches to Piteå it leads southward of Bondön (sec. 10C-10) and westward of Mellerstön (Medlerstö) and Vargön, wooded islands lying about 1 mile eastward and 2 1/2 miles northeastward, respectively, of Bondön. Thence, the channel leads southward of Baggholmen, an island lying about 1 3/4 miles northward of Vargön, and thence in a general northeasterly direction to Tjuvholmssundet (sec. 10C-24).

An **anchorage** northwestward of Baggholmen has depths of 7 to 9 fathoms, clay. Vessels of any draft can approach this anchorage and the inner channel between Piteå and Luleå by two channels. The western channel is entered between Klockgrund (sec. 10C-10) and a group of shoals lying about 4 1/2 miles east-northeastward, and the eastern channel is entered between this group of shoals and Norströmsgrund Light Vessel (sec. 10C-3). **Springaren**, the northwesternmost shoal of the group, has a depth of 1 fathom. **Tärnansgrund**, with a depth of 2 1/2 fathoms, lies on the eastern side of the group; a spar buoy is moored about 1/2 mile eastward of Tärnansgrund. Other patches lie between Springaren and Tärnansgrund. **Inezgrund**, southernmost of the group, has a depth of 3 1/2 fathoms and lies about 6 miles east-southeastward of Bondökallarne Beacon (sec. 10C-10).

The two channels join about 1 3/4 miles eastward of Storrebber, a bare island lying about 3 1/2 miles north-northeastward of Bondökallarne Beacon. **Storrebber Beacon**, a black, square structure with a pointed roof, stands on high ground in the middle of the island.

The buoys, marking the dangers in the approaches to the above channels, have been withdrawn (1966).

From the junction eastward of Storrebber, the channel leads northwestward, passing eastward of Lillrebber, Mellerstön, and Vargön, thence to an intersection with the inner channel between Piteå and Luleå, and to the anchorage off Baggholmen. From this anchorage a channel leads northwestward to Harrbäcksfjärden, about 6 1/2 miles northwestward of Baggholmen, and another channel, available only to small craft, leads northward of Pitholm to Norra Hamnen at Piteå.

Pilots for the inner channels can be obtained from Rönnskär, Piteå, and Luleå.

Directions.—Vessels without pilots should not attempt to use the inner channel from Piteå to Luleå.

Approaching the anchorage northwestward of Baggholmen by the western channel, steer for Storrebbe Beacon on a course of 327°. When Bondökallarne Beacon is in range 276° with the middle of Jävreholmen (sec. 10C-9), steer 000°, passing eastward of a rock, awash, which lies nearly 1 mile southeastward of Storrebbe. When Degerberget (sec. 10C-5), seen between Mellerston and Vargon, bears about 302°, steer for the northern slope of that hill on a course of 305°, passing southward of some shoal patches having a least depth of 4 feet, about 2 1/4 miles eastward of Storrebbe Beacon. When the western end of Olsvenskallen, a low, light-colored rock lying about 1 1/2 miles north-northeastward of Storrebbe Beacon, is abeam, steer to pass eastward of Vargon and westward of Baggholmen to the anchorage.

If using the eastern approach, steer for Storrebbe Beacon on a course of 295° until about 6 miles from the beacon, thence steer 305° for the northern slope of Degerberget, seen between Mellerstön and Vargön, and continue as previously directed.

Prohibited anchorage.—Anchorage is prohibited within 110 yards on each side of an outfall pipe which extends 1 mile eastward from the eastern coast of Pitholm, 1/2 mile northeastward of Bredangesvik, which is nearly 5 miles northwestward of the southeastern extremity of Bondon (sec. 10C-10).

APPROACHES TO LULEÅ

LANDMARKS

10C-18 Måttsundsberget, a 469-foot hill lying about 5 1/4 miles west-southwestward of Luleå, has a long slope on its southern side and is most conspicuous from east-southeastward. Hertsöberget, about 1 mile northeastward of Luleå, is 253 feet high. It has a gradual slope southward but its northern side is steeper. A 574-foot radio mast, marked at night by aircraft warning lights, stands about 1 3/4 miles westward of the summit of

Hertsöberget, and a conspicuous chimney stands at Svartö, about 2 1/2 miles southward of the same summit.

NAVIGATION

10C-19 Vessels bound for Luleå from southward and having arrived at a position on the coastal track (sec. 10B-4) about 17 miles east-southeastward of Rönnskär Light may continue on a course of 017° for about 12 3/4 miles to a position about 1/2 mile westward of Norströmsgrund Light Vessel. This track passes about 3 miles east-southeastward of Simpgrund and leads over a least charted depth of 28 m (15 fms.).

Vessels bound for Luleå from loading places at the northern end of the Gulf of Bothnia and having arrived at a position about 2 miles southwestward of the western end of Malören (sec. 10D-3) may steer a course of 248° for about 21 1/2 miles to a position about 4 1/2 miles east-southeastward of the beacon on Norra Espen. This track passes close north-northwestward of an 11.9 m (6 1/2 fm.) patch lying about 4 3/4 miles west-southwestward of Malören and passes about 1 mile south-southeastward of Kadetten (sec. 10C-25).

CURRENT

10C-20 In Tjuvholmssundet (sec. 10C-24) and Altappssundet (sec. 10C-25) current from Luleälv may attain a rate of 3 knots during spring freshets.

WATER LEVEL

10C-21 During strong northerly winds the water level frequently falls about 2 feet below mean level, and during strong southerly winds it may rise about 2 1/4 feet above that mark. The maximum fall observed over a period of 14 years was about 5 feet and the maximum rise during that period was about 4 1/4 feet.

ICE

10C-22 The approaches to Luleå are usually closed to navigation by ice from the beginning of January to the end of April. During the remainder of the winter season the channels are kept open by ice breakers.

ISLANDS AND ISLETS

10C-23 Rödkallen ($65^{\circ}19' N.$, $22^{\circ}22' E.$), the largest of a group of islets and rocks lying about $13\frac{1}{4}$ miles northeastward of Storrebbe Beacon, is almost bare and is surrounded by shoal water extending about $\frac{1}{2}$ mile from its northern and 1 mile from its southern sides. The shoal water is marked by a spar buoy on its southern side and by a spar buoy on its western side. A tall building, its lower half yellow and its upper half red, stands on Rödkallen and is visible at a considerable distance. A chapel also stands on this islet.

Rödkallen Light is shown on Rödkallen and a fog signal is sounded. A pair of light beacons in range 080° stand on an islet lying about $\frac{1}{2}$ mile southeastward of Rödkallen Light.

Rödkallen Södra Light is shown on the southern end of the islet. A radiobeacon transmit and a pilot lookout station is located at Rödkallen Södra Light.

Sandgrunden, a group of low, barren islets of yellow sand, lies on the northern part of an extensive flat, about 3 miles north-northeastward of Rödkallen. Sandgrunden Beacon, consisting of a pole with white boards covering the supports, and surmounted by a horizontal cask, stands on the northernmost islet of the group.

Södra and Norra Espen, lying about 4 and 6 miles northeastward of Rödkallen, respectively, are thickly wooded islands. A white cairn-shaped beacon with a red band stands on the southeastern end of Norra Espen, the higher of the two.

Germandöhallan and Gråskälsgrund are islets lying about $2\frac{1}{4}$ and $4\frac{1}{4}$ miles westward of Sandgrunden Beacon. Germandöhallan Light is shown from the island of that name

and forms the rear light of a range with Liljeudden Light being the front light. In line these two lights bear 202° . Gråskälsgrund is surrounded by foul ground.

Borussiagrund Light lies about 2.7 miles south-southeastward of Germandöhallan Light and marks a 6.5 m ($3\frac{1}{2}$ fm.) patch.

Germandön, about $3\frac{3}{4}$ miles west-northwestward of Sandgrunden Beacon, is dark, level, and thickly wooded. Liljeudden Light is shown on the southeastern point of Germandön. It forms the front light of a range with Germandöhallan Light. Germandön Light is shown on the eastern side of the island, about 1 mile northward of Liljeudden Light. Two beacons stand about 400 yards southward of Germandön Light. The southwestern beacon is a white triangle and the northeastern one a white rectangle, both having a red diagonal stripe.

Junkön, lying about $1\frac{1}{4}$ miles eastward of Germandön, is nearly divided by a bight on its northern side. A low, sandy isthmus connects the eastern and western parts of the island, the former being dark and wooded, and the latter, known as Stora Skörvgrund (Stora Skorfgrund), being low and almost treeless. Two white beacons stand on the southwestern side of the eastern part of Junkön. Each of these beacons consists of a pole with its supports covered with boards, the rear beacon being surmounted by a diamond-shaped top mark and the front beacon by two horizontal casks. Two pairs of unlighted range beacons (Motvitken Range) stand on the southeastern side of the bight indenting Junkön. Stora Skörvgrund Range unlighted beacons stand on the northern point of Stora Skörvgrund. A white beacon with a white triangle, point down, stands on Lilla Skörvgrund (Lilla Skorfgrund) an islet lying about $\frac{1}{2}$ mile northeastward of the northern point of Stora Skörvgrund.

Sandön is a large island fronting the entrance of Lulefjärden in which is the port of Luleå. Sandön Beacon, a pole sur-

mounted by a white shield marked with a diagonal red cross, stands on the southwestern side of Sandön. Killingholmen unlighted range structures stand on the southern part of the island about 1 mile eastward of Sandön Beacon. Two range lights are shown on the northeastern side of Sandön, about $3\frac{1}{2}$ miles southeastward of the northern point of the island. Sandöören is a small island close southward of the southwestern part of Sandön.

Vitfågelskär (Hvitfogelskär), a wooded islet, lies about $1\frac{1}{2}$ miles eastward of the southeastern extremity of Sandön.

Vitfagelgrundet Light marks a 3 m ($1\frac{3}{4}$ fm.) patch about 300 yards southward of the island.

Brändö, a high and wooded island, lies about $3\frac{1}{2}$ miles eastward of Sandön. A light is occasionally shown from the northwestern extremity of Brändö.

Altappen is an island lying close north-northwestward of a peninsula extending northward from Liggskär, the eastern point of Sandön.

CHANNELS—DANGERS

10C-24 There are two channels of approach leading from seaward to the entrance of Lulefjärden. The main channel leads westward of Rödkallen, between Germandön and Junkön, and through Tjuvholmssundet into Lulefjärden. The secondary channel leads northward of Norra Espen and Junkon, and divides into two branches southward of Lilla Skorvgrund, both branches joining the main channel northeastward of Germandön.

The main channel (see track D on Fairway Plan in section 10D-17) is available to vessels of 25 $1\frac{1}{2}$ foot draft. A 9.8 m ($5\frac{1}{4}$ fms.) patch lies on the western side of the approach to this channel, about $7\frac{1}{4}$ miles south-southwestward of Rodkallen Light. Abelsgrund, a 6.4 m ($3\frac{1}{2}$ fm.) patch, and Sethsgrund, a 5.8 m ($3\frac{1}{4}$ fm.) patch, lies about $6\frac{3}{4}$ miles southwestward and 5 miles west-southwestward, respectively, of Rodkallen Light; each is marked by a spar buoy.

An 11 m (6 fm.) shoal, marked on its southeastern side by Kryssen lighted whistle buoy, lies about 2 miles southward of Rodkallen Light. A spar buoy is moored close northward of the lighted whistle buoy.

Klackarne, lying about $1\frac{3}{4}$ miles northwestward of Rodkallen, has a least depth of 6 m ($3\frac{1}{4}$ fms.) and is marked by a spar buoy on its western side. **Borussiagrund**, lying about 3 miles northwestward of Rodkallen, has a least depth of 6.5 m ($3\frac{1}{2}$ fms.) and is marked by Borussiagrund Light. **Kallfjardgrund**, a shoal with a least depth of 1.6 m (5 ft.), lies from $2\frac{1}{2}$ to $3\frac{1}{2}$ miles north-northwestward of Rodkallen, and is marked on its northwestern side by a spar buoy. A 7.5 m (4 fm.) patch lies about $1\frac{3}{4}$ miles southeastward of Germandöhallan Light. A shoal extending about $\frac{1}{2}$ mile southeastward from Germandöhallan is marked at its end by a spar buoy. Foul ground extending southwestward from Junkon is marked by several spar buoys.

Knosen, a 6.4 m ($3\frac{1}{2}$ fm.) patch marked by a spar buoy, lies about $1\frac{1}{4}$ miles west-northwestward of Sandön Beacon. **Kudden**, a 0.8 m (2 ft.) patch marked on its western side by a spar buoy, lies about $1\frac{3}{4}$ miles north-northwestward of the same beacon.

Tjuvholmssundet (Tjuvholmssund), the narrow passage between the northwestern end of Sandön and the mainland, connects Germandöfjärden, which separates Germandön from Sandön, and Lulefjärden. The channel through Tjuvholmssundet is dredged to a depth of 29 $\frac{3}{4}$ feet and has a width of 197 feet at the bottom. The channel is marked by light buoys and spar buoys in accordance with the uniform system. The light buoys are in position from August 1 to the close of navigation.

Hamnholmen Light ($65^{\circ}32'N.$, $22^{\circ}10'E.$) is shown on the western side of the southern entrance of Tjuvholmssundet. A beacon stands close south-southeastward. Two range lights are shown on Lulnäset, southward of Hamnholmen Light. These lights in range 215° lead through Tjuvholmssundet.

Sandögrundet Light is shown on the eastern side of the channel, about 800 yards westward of the northern point of Sandön. Svartö Light is shown on the northeastern side of the entrance of Lulefjärden, about $\frac{1}{2}$ mile northeastward of Sandögrundet Light. Sandögrundet and Svartö Lights in range 035° lead through Tjuvholmssundet. A number of aircraft warning lights are shown at an airfield westward of Tjuvholmssundet. Some of these lights are visible from seaward.

Traffic signals.—The following signals are displayed from a signal mast on Tjuvholmen, the northwestern point of Sandön, to prevent vessels from meeting while proceeding through Tjuvholmssundet:

One red ball indicates that an inward-bound vessel may pass through the sound.

Two red balls indicate that an outward-bound vessel may pass through the sound.

Three red balls indicate that vessels cannot pass through the sound.

At night red lights replace the balls.

Vessels approaching Tjuvholmssundet and intending to pass through it must, in sufficient time, sound two long blasts, in quick succession, on the whistle or siren. The sound should not be entered until the signal station indicates that it is clear for passage.

Caution.—Irregularly shaped firing and protected areas, extending offshore for a distance of about ten miles, exist in the approaches to and the harbor of Luleå. Foreign vessels must remain within the generally used channels and are advised that local regulations may limit layover time within the protected area to a maximum of seven days.

Mines have been laid in the southern entrance to Tjuvholmsundet. Anchoring is pro-

hibited and navigating through the area during thunderstorms is at the mariner's own risk.

10C-25 The channel from Junkon to Sandofjärden has a least depth of 9 $\frac{1}{2}$ feet. Persgrund, a 5-foot patch marked on its western side by a spar buoy, lies about 1 mile southeastward of the eastern point of Junkon.

Larsgrund, awash, and Aldermansgrund, a 2 $\frac{3}{4}$ -fathom patch, lie about 1 mile northeastward and 1 mile northward, respectively, of the eastern point of Junkön; the former is marked by a spar buoy on its southwestern side and the latter by a spar buoy on its eastern and western sides. Larsgrundet Light (65°28'N., 22°28'E.) is located about 1 $\frac{1}{2}$ miles northeastward of the northeastern extremity of Junkon. A fog signal is sounded at the light. A reef extends about 1 mile eastward from Sandobadan, a rock above water lying about $\frac{1}{2}$ mile southeastward of the southeastern point of Sandön. A rock, awash lies close southward of Vitfagelskar. A 4-fathom patch lies about $\frac{1}{3}$ mile northwestward and a 3 $\frac{1}{2}$ -fathom patch lies about $\frac{1}{2}$ mile west-northwestward of Vitfagelskar. Vitfagelgrundet Light (65°29'30"N., 22°26'E.) is located about 2 $\frac{1}{4}$ miles northward of the northeastward extremity of Junkon. From the eastern side of Liggskar to Altappen the channel is marked by spar buoys.

Altappssundet, westward of Altappen, is a channel dredged to a depth of 9 $\frac{1}{2}$ feet and a width of 98 feet at the bottom. Spar buoys, range lights, and beacons mark the channel through Altappssundet and Sandofjärden on the northeastern side of Sandön. Recent surveys indicate numerous changes in hydrography and topography in Sandofjärden and approaches. Svartosund, at the northwestern end of Sandofjärden, leads into Lulefjärden. Salmon traps extend into the channel from both sides of Svartosund.

The channel northward of Norra Espen and Junkön (see track E on Fairway Plan in section 10D-17) is available to vessels of 28 $\frac{1}{2}$ -foot draft. Torsgrund, lying about 1 $\frac{3}{4}$

miles southeastward of the beacon on Norra Espen, has a least depth of 2 1/2 fathoms and is marked on its eastern side by a spar buoy, and on its northern side by a lighted Whistle Buoy. Kadetten, a 4 1/4-fathom patch marked on its southwestern side by a Spar Buoy, lies about 3 3/4 miles eastward of the same beacon. Bjornklack Light, a radar beacon transmits, lies about 2 1/2 miles east-northeastward of the northern point of Norra Espen and marks a 5.4 m (2 3/4 fm.) spot. Several unmarked shoal patches lie near the northeastern side of the channel between Kadetten and Bjornklack. A 4.4 m (2 1/4 fm.) patch, marked by a spar buoy on its northeastern side, lies about 1 mile north-eastward of the northern point of Norra Espen, and close westward of this patch is a 2 m (1 fm.) patch. Framfoten, with a least depth of 5.5 m (3 fm.), lies about 1 1/4 miles northward of the northern point of Norra Espen and is marked on its northeastern side by a spar buoy.

ANCHORAGES

10C-26 Between the northern end of Sandgrunden and Sodra Espen there is anchorage in depths of 17.7 to 21.9 m (9 3/4 to 12 fms.), sand and mud. Anchorage is available in a depth of 10 m (5 1/2 fms.), mud, close north-northwestward of Germandon Light, and in depths of 10 to 20.1 m (5 1/2 to 11 fms.), mud, near the northeastern side of Germandoffjarden. Anchorage is also available northeastward of Altappen in depths of 6.7 to 10.9 m (3 1/4 to 6 fms.), sand and clay.

PILOTS

10C-27 Pilots are stationed on Rodkallen and meet vessels about 2 miles off that islet. Departing vessels obtain pilots from Lulea. For general information regarding pilotage in Swedish waters see sectional 1-25.

A LIFESAVING STATION is maintained at Rodkallen.

DIRECTIONS

10C-28 MAIN CHANNEL.—If bound for Lulea from southward and having arrived at a position about 1/2 mile westward of Norstromsgrund Light Vessel (sec. 10C-4), steer

000° until Germandon Light bears 350°, thence steer for it on that bearing, passing westward of Klackarne and Kalffjardgrund, and eastward of the light marking Borussiagrund, thence between Germandohallan and Graskalgrund. When Junkoklippen, an islet nearly 1 1/4 miles northward of Graskalsgrund, is open southward of Junkon, bring Liljeudden and Germandohallan Lights in range 202° astern, this range leading about 600 yards eastward of Germandon Light. After passing eastward of Germandon Light, alter course northward and bring Hamnholmen Light and the beacon south-southeastward of it in range 332°. This range leads through Germandoffjarden to the southern entrance of Tjuvholmssundet, passing eastward of Knosen and westward of Kudden.

If Norstromsgrund Light Vessel is not on station, bring Rodkallen Light to bear between 005° and 020° as soon as it is sighted, and steer toward it until Germandon Light bears 350°, thence proceed as previously directed.

At night, after passing about 1/2 mile westward of Norstromsgrund Light Vessel, steer 358° until Germandon Light bears between 345° and 351°, thence keep between those bearings which limit the white sector of the light. When about 3/4 mile southward of Germandon Light, bring Liljeudden Light astern bearing 202°, and steer 022°, this course lying in the white sector of Liljeudden Light. When about 1 1/4 miles north-northeastward of Liljeudden Light, alter course gradually northward and steer for Hamnholmen Light, bearing 332°, keeping within the white sector of that light.

SOUTHEASTERN APPROACH CHANNEL.—Vessels should pass to the eastward of Farstugrunden (sec. 11C-3) about 1,200 yards until Hertsöberget comes in range bearing 319°; steer this course until Larsgrundet light bears 315°, thence after course to the westward and steer this course, leaving Bjornklack to the eastward, until about 2 miles southeastward of Larsgrundet Light, thence after course northward to pass to the northeastward of Larsgrundet; thence with Bjornohallan in range 308.5°, pass through the dredged channel southwestward of Vitfagelgrundet light and through the dredged cut at Klupbnaset; thence follow the dredged channel through Sandoffjarden to Svartosund; the channel is well marked by buoys and lighted range beacons.

CHANNEL NORTHWARD OF NORRA ESPEN AND JUNKON.—This channel is no longer used during hours of darkness. Lighted aids have been discontinued but the structures with their daymarks remain. Approaching this channel, steer for the highest part of Hertsoberget (sec. 10C-18) on a course of 319° . Hertsoberget can be identified on this bearing by the alinement with it of some houses on Liggskar. This course leads northeastward of Farstugrunden (sec. 10C-3), and southwestward of Kadetten and Bjornklack. When the unlighted Killingholmen Range structures on the southern side of Sando are in range 302° , steer for them, passing northeastward of Norra Espen and Junkon.

If bound for Altappen, after passing eastward of Larsgrundet Light, alter course to the northward and pass eastward of Vitfagelgrundet Light about 500 yards, thence steer to pass between the buoys marking Henriksgrund, a 4.8 m (2 1/2 fm.) patch, to the eastward and Stromgrund, a 5 m (2 3/4 fm.) spot to the westward, thence proceed to the anchorage off Altappen or the entrance of Altappssundet, keeping nearer the northeastern side of the channel than the southwestern side. Vessels should not attempt to pass through Altappssundet without a pilot.

If bound for Tjuvholmssundet, continue to steer for the range lights on the southern side of Sando until the Stora Skovgrund unlighted range structures on the northern point of Stora Skovgrund are in range 242° . This range leads through a buoyed channel northwestward of the eastern part of Junkon. This channel divides southward of Lilla Skovgrund, the sides of the northern and deeper branch being indicated by the two pairs of range beacons on the southeastern side of the bight indenting Junkon. Each pair of beacons, when in range, bears 135° . Both branches of the channel are marked by spar buoys, and join the main channel westward of the southern end of Sandooren.

SANDO CHANNEL (Sandoleden).—A new deep-draft channel has been dredged to accommodate large ore-carriers at the new (1964) modern ore-loading berths at Svarton. The new (1967) Sando Channel will accommodate vessels with drafts up to 37 feet (35,000 tons D.W.). The channel is about 7 miles in length, of which 5 1/2 miles has been dredged, with a general bottom width of about 330 feet except for a one mile section with a bottom width of about 250 feet. The depth for the dredged section is 40 feet. A canal about 1/2 mile long has been cut through the Isthmus of Sandoklubb.

Traffic in Sando Channel will be mainly one way. Ballasted vessels inbound for Lulea will normally use Tjuvholmssundet Channel. Deep laden outgoing vessels will use Sando Channel. To enable large vessels to transit the channel in both directions, facilities for alternating one-way traffic will be provided.

Sando Channel will pass eastward of Sando, through the Isthmus of Sandoklubb, thence seaward between Junko and Brando.

The channel is well marked by lighted ranges, and lighted and unlighted buoys.

LULEA

Position: $65^{\circ} 35' N., 22^{\circ} 10' E.$

Depths: Approach, main channel, 25 1/2 feet (maximum draft).

Approach, northward of Junkon, 28 1/2 feet (maximum draft).

Tjuvholmssundet, 29 3/4 feet.

Sando Channel, 37 feet (maximum draft)

Anchorage, 3 3/4 to 10 3/4 fathoms.

Harbor, 21 to 46 feet.

Berths, 14 1/2 to 29 1/2 feet.

Tidal rise: Negligible.

Port plan: See section 10C-37.

10C-29 LULEA, on the eastern side of Lulefjarden, is the principal Swedish port in the northern part of the Gulf of Bothnia.

The harbor consists of two parts, Norra and Sodra Hamnen. At Svarto, close southeastward of Lulea, there are facilities for loading iron ore. Karlsvik and Karlshall, loading places northwestward of Lulea, are within the limits of the port.

NAVIGATION

10C-30 See section 10C-19.

CURRENTS

10C-31 See section 10C-20.

ICE

10C-32 The port is usually closed to navigation by ice from the beginning of January to the end of April. At other times it is kept open by an icebreaker when necessary.

DEPTHS

10C-33 The channel leading to Lulea from seaward, and passing northward of Norra Espen and Junkon has a least depth of 29 3/4 feet to the ore-loading berths at Svarto and an anchorage in Lulefjarden. Vessels of 29 1/2-foot draft can use the main channel by day or night. The depths in Norra and Sodra Hamnen are 21 to 46 feet. The depths at the berths are described in section 10C-37.

HARBOR

10C-34 Norra Lulefjarden and Sodra Lulefjarden, the roadsteads of Lulea, lie north-northwestward and south-southeastward, respectively, of the town of Lulea which stands on a peninsula on the eastern side of the fjord. There is ANCHORAGE in Sodra Lulefjarden in depths of 3 3/4 to 10 3/4 fathoms and in Norra Lulefjarden in depths of 3 3/4 to 4 3/4 fathoms, mud, sand, and clay in both. Anchorage is prohibited in the vicinity of SUBMARINE CABLES crossing the strait westward of the town. The QUARANTINE ANCHORAGE, marked by a yellow BUOY, is located westward of Grasaloren, an islet lying near the middle of Sodra Lulefjarden. A bascule bridge with a fairway of 98 feet crosses the channel between Lulea and the western side of Lulefjarden; there is a vertical clearance of 24 feet under the draw span when closed. Navigation lights and

TRAFFIC SIGNALS are shown at the bridge opening.

SODRA AND NORRA HAMNEN adjoin the southern and northern sides of the peninsula on which Lulea is situated. Quays, wharves, and piers are located in both parts of the harbor and at Svarto. There is an oil depot at Uddebo, on the northeastern side of Svarto-sund.

LOADING PLACES.—Karlsvik, about 1 mile northwestward of Lulea, has an anchorage with a depth of 4 1/2 fathoms, sand.

Karlshall, about 3/4 mile northwestward of Karlsvik, has anchorage off the quays with depths of 3 1/4 to 4 3/4 fathoms, sand. A buoyed channel with a depth of 19 1/2 feet leads to the anchorage. Larger vessels can anchor outside the entrance channel.

NAVIGATIONAL AIDS.—A light is shown on the head of a pier on the northern side of Sodra Hamnen.

A light buoy painted red is moored on the southern side of the entrance of Norra Hamnen.

Spar buoys mark the dangers adjacent to the fairway in Lulefjarden.

PILOTS

10C-35 See section 10C-27.

DIRECTIONS

10C-36 See section 10C-28.

FACILITIES

10C-37 Lulea, with a population of about 31,000 in 1959, is the capital of the district of Norrbotten. It is the leading Swedish port in the export of iron ore, and also exports timber and wood pulp. Coal, coke, fuel oil, machinery, salt and food products are imported. There is a customhouse at Lulea.

BERTHS.—Norra Langkajen, on the southern side of Norra Hamnen, is 535 feet long and has a depth of 21 feet alongside. A coal wharf on the southwestern side of Norra Hamnen is 590 feet long, with a depth of 19 1/2 feet at a distance of 13 feet from it. Westward of this wharf are quays having a total length of about 820 feet, with depths of 14 1/2 to 19 1/2 feet alongside.

In Sodra Hamnen, Hamnpiren, projecting from the southern side of the town, is about

885 feet long and has depths of 18 to 20 feet alongside. Sodra Langkajen, extending westward from the root of Hamnpiren, is 804 feet long, with a depth of 21 feet at a distance of 3 to 10 feet from the quay. Trakajen, extending eastward from the root of Hamnpiren, is 315 feet long, with a depth of 18 feet alongside. Djupkajen, eastward of Trakajen, is 475 feet long, with a depth of 26 feet alongside.

The new modern ore-loading installation located on the southwestern side of Svartön is now in operation. Reports indicate the former ore-piers, about one mile northwestward, are no longer in use and are being demolished. The ore pier is about 1,300 feet long with depths of 42 feet in the approaches. Vessels can load simultaneously at each side of the pier which will accommodate two 45,000 ton (D.W.) vessels along one side at the same time. Conveyor systems supply the mobile ship loaders which can be adjusted to load any type of vessel at a rate of 4,000 tons per hour per loader.

At Uddebo, a pier for oil tankers a depth of 26 feet alongside. Two mooring buoys are located off the pier.

A new oil pier with a depth of 40 feet alongside is located at Udebo.

At Karisvik there is about 650 feet of quayside with depths of 16 to 23 feet alongside. Karlshall has a quay 426 feet long, with depths of 20 to 21 feet alongside, and another quay 394 feet long, with depths of 11 1/2 to 16 feet alongside.

One 18-ton crane and two 6-ton cranes are located on the quays of Sodra Hamnen. There are one 10-ton, one 8-ton, six 6-ton, and two 4-ton cranes on the quays at Svartön. The berths in Sodra Hamnen, and at Svartön and Uddebo are connected to the general railroad system. Tugs are available.

SUPPLIES.—Provisions, coal, and fuel oil can be obtained. **WATER** is piped to most of the quays and can be supplied by water boat. The water in the harbor remains quite fresh until fall and is used by many vessels to fill their tanks.

REPAIRS.—There is a shipyard with machine shops and marine railways for small vessels. A salvage vessel, suitable for ice-breaking, is available.

COMMUNICATIONS.—Steamer communication is maintained with Stockholm and other Swedish ports, and also with Danish and German Baltic ports. There is air transportation to Stockholm. Lulea is connected to the general railroad system. A radio station is located at Boden, about 23 miles from Lulea.

DERATIZATION.—See section 1-7.

MEDICAL.—There is a hospital in Lulea.

ANCHORAGES

10C-38 KINNBÄCKSFJÄRDEN.—See section 10C-11.

JÄVREFJÄRDEN.—See section 10C-11.

HUVAN ANCHORAGE.—See section 10C-11.

SKUTHAMN.—See section 10C-14.

MUNKSUND.—See section 10C-14.

TINGSHOLMEN.—See section 10C-14.

STORFORS.—See section 10C-14.

LOVHOLMEN.—See section 10C-14.

BÄGGHOLMEN.—See section 10C-17.

EASTWARD OF GERMANDON.—See section 10C-26.

GERMANDOFJÄRDEN.—See section 10C-26.

ALTAPPEN.—See section 10C-26.

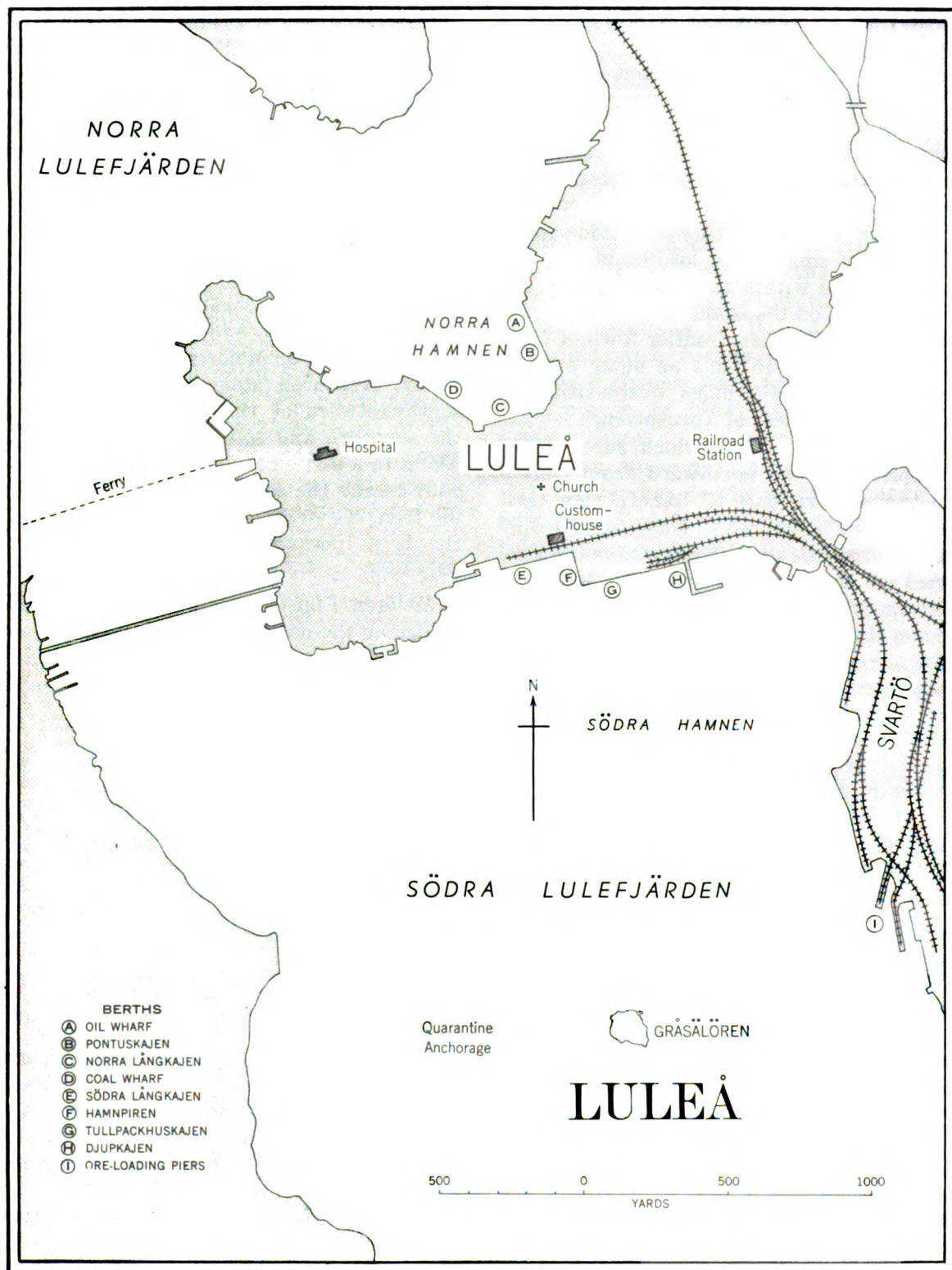
LULEFJÄRDEN.—See section 10C-34.

PART D. HERTSO TO THE FINNISH FRONTIER

10D-1 HERTSO (southeastern end, 65° 32' N., 22° 24' E.) is a peninsula extending south-eastward from the eastern side of Lulefjärden. The southwestern side of Hertso, which is very irregular, forms the northeastern side of the approach to Lulea through Altappsundet, Sandofjärden, and Svartosund (sec. 10C-25).

COAST—GENERAL

10D-2 The entrance of Torneälven, the river forming the border between Sweden and Finland, is about 46 1/2 miles east-northeastward of the southeastern end of Hertso. The intervening coast is wooded, very ir- (continued on page 406)



regular, and is indented by several extensive fjords.

A maze of islands, rocks, and shoals off this coast and within the fjords is so intricate that the channels through it can be safely navigated only with the aid of local pilots. The islands, like the coast, are wooded and are not easily distinguishable from seaward.

This part of the coast has no major ports. A number of small ports, loading places, and anchorages lie within the fjords. There are loading places on the island of Seskarön (sec. 10D-14). The Swedish frontier town of Haparanda (sec. 10D-15) has an outer port on the coast, about 6½ miles west-southwestward of the entrance of Torneälven.

Caution.—An area in which surveys are incomplete extends northward from Hertsö into the western part of Rånefjärden (sec. 10D-6).

Local magnetic disturbances have been reported off the coast described in this part, particularly in the approaches to Rånefjärden and Haparanda. (See section 1-9.)

An irregularly shaped protected area encloses a portion of the coastline from westward of Törefjärden to Seskarö. Vessels are advised that local regulations may limit layover time within the area to a maximum of seven days.

DEPTHS—OUTER ISLANDS AND DANGERS

10D-3 The depths in the northern part of Bottenviken are very irregular, with shoal patches lying up to 10 miles seaward of the outermost islands.

Kallen, a barren rock which is easily distinguished from eastward, lies close southward of Småskären, an island lying about 3¼ miles eastward of Brändö (sec. 10C-28). A chapel stands on Småskären and another chapel stands on Brändöskär, an island about 2¼ miles north-northeastward of Småskären. A 5¼-fathom patch lies about 1¾ miles east-southeastward of Kallen and a 3¾-fathom patch lies about 2½ miles eastward of the northern point of Småskären. Storggrund, above water, lies about 1 mile southward of Brändöskär.

Malören, the southernmost of the islands lying off the coast between Törefjärden and Torneälven, is about 18 miles eastward of Brändöskär. A 4¼-fathom patch lies about 5 miles westward of Malören and a 6-fathom patch lies about 1½ miles southwestward of the island. A 6½-fathom patch lies nearly 5 miles southwestward of Malören and two 8¼-fathom patches lie about 3¼ miles southward of the same island. Numerous other dangers lie northward of a line between the southern extremities of Brändöskär and Malören. A light structure, a chapel, and a number of houses and huts stand on Malören which is bare and sandy. A beacon stands on a rock south-southwestward of the chapel. Reefs fringe the southern and southeastern sides of the island to a distance of about ½ mile; a spar buoy marks the edge of shoal water extending from the western end of the island. Malören is a lifesaving and pilot station (sec. 10D-16).

Malören Light (65°32' N., 23°34' E.) is shown on the northeastern side of the island. A radiobeacon is located at the light. A light is also shown on the western end of the island.

Sandskär, an island lying about 4¾ miles east-northeastward of Malören, has a narrow tongue of land extending northward. The island is partly wooded, and on it are some light-colored sand hills, 69 feet high. The isthmus joining the northern tongue to the main part of the island is bare and light-colored. A chapel and some huts stand near the southern end of the island. Two range lights for the use of fishing vessels are occasionally shown at the southern end of Sandskär.

Several shoals lie between Malören and Sandskär. A number of shoal patches lie up to 9 miles southeastward and east-southeastward of Malören, and 11 miles southeastward of Sandskär. The outermost of these are a 5¼-fathom patch lying about 6 miles southeast of Malören Light, a 4 1/4-fathom patch lying about 1 mile farther eastward, a 3½-fathom patch lying about 7¼ miles east-southeastward of Malören Light, and a shoal

with a least depth of $3\frac{3}{4}$ fathoms, lying about 11 miles southeastward of Sandskär. Many dangers lie between these outer ones and the coast northward.

NAVIGATION

10D-4 For navigation to Malören along the coastal track on the western side of the Gulf of Bothnia, see section 10C-4.

Vessels approaching Malören from the coastal track on the eastern side of the Gulf of Bothnia and having arrived at a position about $\frac{1}{2}$ mile southeastward of Kemi Light Vessel (sec. 11B-8) may steer a course of 270° for about 5 miles, thence a course of 287° for about $14\frac{1}{4}$ miles to a position about 2 miles southwestward of the western end of Malören. This track leads over a least depth of $5\frac{1}{2}$ -fathoms. Several patches with less than 4-fathoms lie close northward of this course.

For navigation from Norra Kvarken to Malören, see section 10-3.

CHANNELS

10D-5 Inner passage.—An inner passage (see tracks F and G on Fairway Plan in section 10D-17) within the outer islands and dangers, leads from Luleå to Haparanda. This passage is well marked by buoys and beacons, and branches lead from it to a number of loading places. From a position off Liggskär (sec. 10C-23), vessels of 21-foot draft can use the passage as far as the section lying southward and southeastward of Ranon (sec. 10D-7), where the maximum draft is restricted to 11 $\frac{1}{2}$ feet. Thence, a draft of $19\frac{1}{2}$ feet can be accommodated to Haparandahamn (sec. 10D-15), eastward of which the channel shoals, and in the entrance of Torneälven is accessible only to vessels of less than 5-foot draft. For information on pilots see section 1-25.

Channels from seaward.—Channels lead from the vicinity of Malören to the various loading places in the fjords and estuaries indenting this part of the coast, and to the loading place on Seskarön (sec. 10D-14.) These channels are described with the related features, and their general trends are shown on the Fairway Plan in section 10D-17.

COASTAL FEATURES—LANDMARKS

10D-6 Rånefjärden (Råne Fjärd), entered about 15 miles northward of the southeastern extremity of Hertsö, is much encumbered with islands, rocks, and shoals. A buoyed channel leads from the inner passage, previously described, to Strömsund, a loading place at the northern end of the fjord. An anchorage in the outer part of Rånefjärden has depths of $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms, mud. Vessels of 21-foot draft can reach this anchorage from the inner passage, and a channel which connects with a channel from Malören to Törefjärden permits vessels of similar draft to approach from seaward. From the anchorage to Strömsund the channel is accessible to vessels of 11-foot draft. A light is shown at a boat harbor on the western side of Rånefjärden.

Strömsund has a wharf 65 feet long, with depths of $8\frac{1}{2}$ to $11\frac{1}{2}$ feet at a distance of 10 feet from it. There is anchorage in a depth of about 15 feet, mud, about $11\frac{1}{2}$ miles southward of Strömsund.

Rörbäck, a loading place on the western side of an inlet entered about $2\frac{1}{2}$ miles east-northeastward of Rånefjärden, has two small piers with depths of 15 feet and $14\frac{1}{2}$ feet, respectively, at a distance of 10 feet from them. Vessels anchor and secure with stern moorings to the shore. Cargo is loaded from lighters. A channel for vessels of 21-foot draft leads to the anchorage.

TÖREFJÄRDEN AND APPROACHES

10D-7 Törefjärden, entered about 5 miles eastward of Rånefjärden, contains a number of islands and shoals. Two channels, separated by a group of islands and shoals in the outer part of the fjord, lead from the entrance to Törefors and Töre Hamn, loading places at the head of Törefjärden; these channels unite about midway between the entrance and the head of the fjord. Buoys and range beacons mark the channels within the fjord and in the approaches to it. Two range lights shown on the western side of Törefjärden lead to a boat harbor at Siknäs, Pålängeberget, about $2\frac{1}{2}$ miles eastward of the entrance of Törefjärden, is a flat-topped hill 328 feet high. Bergön and Rånön are the largest of a number of islands extending southeastward from the western side of the entrance of the fjord. A 240-foot hill rises on Bergön and a 256-foot hill on Rånön. A submarine cable extends from the northern end of Rånön to the mainland northeastward.

The main approach channel to Törefjärden leads northwestward from Malören, passing northeastward of Hastaskär, an island lying about 2 miles southeastward of Rånön, and through Storöfjärden and Pålängefjärden lying northeastward and northward of Rånön. A light is shown from a beacon standing on a reef about $\frac{3}{4}$ mile southward of Hastaskär, Storö Light is shown on Skagsudde about $1\frac{1}{2}$ miles northward of Hastaskär. Three pairs of range lights for the use of fishing vessels are shown on the eastern side of Storöfjärden. Vessels of 26-foot draft can proceed from Malören to Pålängefjärden, thence vessels of 22-foot draft can continue through the eastern entrance channel to the head of Törefjärden. (See track H on Fairway Plan in section 10D-17).

The western entrance channel is approached by a channel branching from the inner passage, about $5\frac{1}{2}$ miles southwest-

ward of Bergön. Vessels of 21-foot draft can use this channel to Pålängefjärden.

Anchorage can be obtained in depths of $7\frac{1}{2}$ to $11\frac{1}{2}$ fathoms, mud, northwestward of Skagsudde, a point on the mainland about $2\frac{3}{4}$ miles eastward of the eastern side of Rånön. Anchorage can also be obtained in a depth of $5\frac{1}{2}$ fathoms, mud, close northward of Stora Fårö, an island in the southern part of Törefjärden, about $1\frac{1}{4}$ miles northward of Bergön; there is a depth of only about 16 feet in the channel leading to this anchorage.

Water level in Törefjärden may vary from about 6 feet below mean level to $5\frac{1}{2}$ feet above it. Strong northerly winds cause the water to fall and strong southerly winds cause it to rise.

Ice usually obstructs navigation in Törefjärden from the beginning of November to the middle of May.

Pilots.—See section 10D-16.

10D-8 Directions.—If bound for Törefjärden and having arrived at a position about 2 miles southwestward of the western end of Malören, steer northward to a position about $1\frac{3}{4}$ miles westward of Malören Light, thence steer 335° toward Lutskärsgrund Light ($65^\circ 40' N.$, $23^\circ 20' E.$), standing on a small rock surrounded by foul ground, about 6 miles eastward of Hastaskär. This course passes southwestward of Flatbotten, a $4\frac{1}{2}$ -fathom patch, and Torget, a 4-fathom patch marked on its southwestern side by a spar buoy, lying about 3 and 4 miles, respectively, northwestward of Malören Light; it passes northeastward of Nordvästgrund, a shoal with a least depth of $2\frac{1}{4}$ fathoms, lying about $4\frac{3}{4}$ miles southeastward of Lutskärsgrund Light, and marked by a spar buoy moored about $\frac{3}{4}$ mile east-southeastward of its shoalest part. When Skagsudde bears 305° steer toward it on that bearing. Most of the dangers adjacent to this part of the track are marked by spar buoys.

When northeastward of a **beacon** standing on Gräddmanshällan, a reef lying about $\frac{1}{2}$ mile northeastward of Hastaskär, alter course to pass about $\frac{1}{4}$ mile southwestward of Skagsudde. Thence steer 315° through Storöfjärden and when northeastward of a **spar buoy** marking the northeastern side of Rånögrund, a shoal with a least depth of 5 feet, lying about $\frac{1}{2}$ mile northward of Rånön, steer 302° to the entrance of Törefjärden and proceed into the eastern entrance channel, being guided by the buoys and range beacons marking the channel to the head of the fjord.

Törefors, near the inner end of Törefjärden, has an **anchorage** with depths of $19\frac{1}{2}$ to $29\frac{1}{2}$ feet, mud and clay, and accessible to vessels of 22-foot draft. Vessels at anchor secure with stern moorings to dolphins. There is about 240 feet of quayage with a depth of 16 feet alongside, and about 740 feet of quayage with depths of $9\frac{1}{2}$ to 13 feet alongside. Cargo, with the exception of wallboard, is loaded from lighters. A small tug is available. Provisions and water can be obtained. There is a machine shop.

Töre Hamn, about 1 mile northwestward of Törefors, has about 623 feet of quayage with a depth of 23 feet alongside. A quay at the small boat harbor close northward has a berthing length of 164 feet with depths of $6\frac{1}{2}$ to 10 feet alongside. Anchorage off the quays is accessible to vessels of 22-foot draft. Provisions, water, and a limited quantity of coal and fuel oil can be obtained.

APPROACHES TO KALIXÄLV AND VÄNAFJÄRDEN

10D-9 Kalixälv is entered between two points on the mainland, lying about $5\frac{1}{2}$ and $7\frac{1}{2}$ miles northeastward of Skagsudde. Väna fjärden lies immediately eastward of the entrance of Kalixälv. The approaches to this river and fjord are much encumbered with islands, rocks, and shoals, and the range

marks are far off; therefore, the channel from seaward should not be attempted without local knowledge. If a pilot is not immediately available at Malören, anchorage should be taken off that island in fair weather, or in the anchorage northwestward of Skagsudde in bad weather.

Dangers.—Vikströmsgrund, a 4-fathom patch, lies about $2\frac{1}{4}$ miles east-southeastward of Lutskärsgrund Beacon and is marked on its eastern side by a spar buoy with a radar reflector. Halsöbadan, a $1\frac{1}{2}$ -fathom patch marked by a spar buoy on its western side, and Läsgrund, a group of shoal patches with a least depth of 3 fathoms, lie about 4 miles eastward and $1\frac{3}{4}$ miles east-northeastward, respectively, of Lutskärsgrund Beacon. Several shoal patches lie between Vikströmsgrund and Läsgrund. A 3-fathom patch close eastward of Läsgrund is marked on its western side by a spar buoy. A $2\frac{1}{4}$ -fathom patch lies about $1\frac{3}{4}$ miles northeastward of Lutskärsgrund Beacon. Bergströmsgrund, a shoal with a least depth of 3 feet, marked by two spar buoys on its eastern side, and Vikundan, a $1\frac{1}{2}$ -fathom patch marked by a spar buoy on its western side, lie about 2 and $2\frac{3}{4}$ miles, respectively, north-northeastward of Lutskärsgrund Beacon. From Vikundan to the entrance of Kalixälv, several other dangers adjacent to the channel are marked by spar buoys.

Channels—Depths.—The approach channels to Kalixälv from seaward lead northward from the vicinity of Malören. (See Track I on Fairway Plan in sec. 10D-17). The channel passing westward of Stora Glubben accommodates vessels with a draft of $16\frac{1}{2}$ feet while that eastward thereof accommodates vessels with a draft of 31 feet. The two channels unite eastward of Holmgrund, a shoal lying about $2\frac{1}{4}$ miles southward of the northeastern entrance point of Kalixälv. From Holmgrund

vessels of 20-foot draft can continue to Karlsborg, a loading place on the eastern side of the entrance of Kalixälvs. A secondary channel between Holmgrund and Karlsborg is available for vessels of 16-foot draft. A channel for vessels of 18-foot draft branches from the channel eastward of Holmgrund and leads to an anchorage northward of Långören, an island lying about $\frac{3}{4}$ mile southeastward of the southwestern entrance point of Kalixälvs. A channel for vessels of 21-foot draft leads from the channel eastward of Holmgrund to Axelsvik, a loading place on the eastern side of Vånafjärden, and a channel for vessels of 13½-foot draft leads to the head of Vånafjärden.

A channel to Båtskärsnäs (sec. 10D-13) for vessels with a draft of 22 feet branches northward of Stora Glubben from the eastern portion of the approach channels to Kalixälvs from Malören.

Kalixälvs and Vanafjärden can also be approached from the inner passage described in section 10D-5.

Current.—During freshets and in midsummer a strong current setting out of Kalixälvs may be experienced in the approach to the river entrance, but it is not sufficiently strong to hinder navigation.

Water level.—The maximum observed range of water level is between about 5 feet above mean level and about 4 feet below. The greatest variation occurs in September and October. A rise of the water level is caused by strong southerly and southwesterly winds, and a fall is caused by strong northerly and northwesterly winds.

Ice usually obstructs navigation from the beginning of November to the middle of May.

Landmarks.—Gölihatten, a 214-foot wooded hill with a rounded top, lies on the peninsula which forms the eastern side of Vånafjärden, about 2¾ miles eastward of Karls-

borg. A red chimney, 220 feet high, and a yellow chimney, 148 feet high, stand at Karlsborg and are visible from a considerable distance seaward.

10D-10 Aids to navigation.—Repskärsgrund Light is shown on Repskärsgrund, a wooded islet lying about 3¾ miles northward of Lutskärsgrund Beacon.

Dyråsholmen Light is shown on Dyråsholmen, an islet lying about 3¾ miles north-northwestward of Repskärsgrund. Another light is shown on the southeastern side of the islet.

Kvarnören Light is shown on Kvarnören, a wooded islet lying about ½ mile east-southeastward of Dyråsholmen.

Karlsborg (Korsnäsberget) Light is shown on the mainland, about 1¼ miles north-northwestward of Kvarnören Light.

Halsöklippor Light is shown on an islet lying about 2½ miles eastward of Repskärsgrund.

Vippgrund Light is shown on an islet lying about 1¾ miles northward of Halsöklippor Light.

Trutskärsbådan Light is shown from a structure standing about 1 mile northeastward of Repskärsgrund Light.

Range lights are shown close northwestward of Karlsborg and at Ytterslandet.

Beacons stand on Repskärsgrund, Kvarnören, and Stora Gubben, a rock lying about 3¼ miles northeastward of Lutskärsgrund Beacon.

Anchorage.—There is anchorage in depths of 7 to 7½ fathoms, mud, about ½ to ¾ mile northward of Repskärsgrund. Vessels should not anchor with Repskärsgrund Beacon bearing less than 180°.

There is anchorage in Rossörssund, northward of Långören, in depths of 3¾ to 5 fathoms, mud. A buoyed channel leads to this anchorage.

Pilots.—See section 10D-16.

Directions.—From a position about $1\frac{1}{4}$ miles westward of Malören Light, steer 335° toward Lutskärsgrund Beacon. When about 5 miles from the beacon, and with Halsöklippor and Vippgrund Lights in range 006° , steer in on this range. This course leads about $\frac{3}{4}$ mile westward of Torget and about $\frac{1}{4}$ mile eastward of Vikströmsgrund. When a little over $\frac{1}{2}$ mile northeastward of Vikströmsgrund, alter course to bring Repskärsgrund Light in range 333° with Dyråsholmen Light. This course passes over a least depth of $16\frac{1}{2}$ feet (1968). When about $\frac{1}{4}$ mile northeastward of Bergströmsgrund, alter course to bring Kvarnören and Karlsborg light houses in line 338° . Thence proceed to the entrance of Kalixälv or to Vänafjärden, being guided by the spar buoys, beacons, and range lights marking the channels.

Vessels of deep draft may proceed from a position westward of Malören Light on a course either to Lutskärsgrund Beacon or to Halsöklippor and Vippgrund Lights in range. Clearing Torget, course is then shaped along this latter range on a heading of 006° until a point is reached about $\frac{1}{2}$ mile abeam and eastward of the beacon on Stora Glubben, at which point a course is shaped directly for Trutskärsbåden Light on a heading of about 321° . When not less than $\frac{1}{2}$ mile from Trutskärsbåden, course is altered to about 295° so as to bring Halsöklippor Light directly astern. Proceeding on this heading of 295° until the beacon on Repskärsgrund bears southerly, course is then altered to starboard in order to bring Kvarnören and Karlsborg Lights into range bearing 338° . This range indicates the approach either to Kalixälv or Vänafjärden.

LOADING PLACES IN KALIXÄLV AND VÄNAFJÄRDEN

10D-11 Karlsborg ($65^\circ 48' N.$, $23^\circ 17' E.$), on the eastern side of the mouth of Kalixälv, is the port for Kalix which lies farther up the river. There is about 443 feet of quayage with a depth of $18\frac{1}{2}$ feet alongside and 2,132 feet of quayage with depths of 10 to $20\frac{1}{4}$ feet alongside. An anchorage off the quays has a depth of 18 feet, mud. Vessels

unable to complete loading at Karlsborg can do so at the anchorage in Rossörssund. There is a 12-ton crane. Tugs are available. Provisions, water, and a small quantity of coal can be obtained. A machine shop and marine railways for small vessels are maintained.

Kalix (Nederkalix), on the east bank of Kalixälv, about 5 miles northwestward of Karlsborg, is accessible to vessels drawing 8 feet. The channel from Karlsborg to Kalix is marked by buoys and beacons. There is about 413 feet of quayage with depths of $6\frac{1}{2}$ to $11\frac{1}{2}$ feet alongside. Tugs are available. Provisions, water, and fuel oil can be obtained. Minor repairs can be made. A customs station is located at Kalix.

Axelsvik, about $2\frac{1}{2}$ miles southeastward of Karlsborg, has an anchorage with a depth of 19 feet, mud and stones. There is a wharf with a depth of 10 feet alongside. Vessels can complete loading in Rossörssund.

Axelsvik oil harbor is an offshore oil berth immediately northwestward of Axelsvik. Vessels drawing up to 31 feet secure to four mooring buoys anchored about 295 feet distant from an oil wharf. Oil is transferred by means of a floating hose connection.

BÅTSKÄRSNÄS AND APPROACHES

10D-12 Båtskärsnäs, a loading place on the western side of the entrance of Sangisfjärd, the next large inlet eastward of Vänafjärden, can be approached from seaward by vessels drawing 22 feet. Halsö, about $3\frac{1}{4}$ miles eastward of Repskärsgrund, and Granön, about $\frac{2}{3}$ mile farther eastward, are the largest of a number of islands which, with many shoals and rocks, lie in the immediate approach to Sangisfjärd.

Dangers.—Nordgrund, a 2-fathom patch marked on its southern side by a spar buoy, lies about $3\frac{1}{2}$ miles northward of Malören Light. A group of shoal patches with a least depth of 4 fathoms lies about 4 miles north-northeastward of Malören Light. A $3\frac{1}{2}$ -fathom patch lies about $1\frac{1}{2}$ miles westward of the northwestern point of Sandskar. Blombäcksggrund, a $1\frac{1}{2}$ -fathom patch marked by a spar buoy on its southeastern side, lies about 1 mile southeastward of Gunnaren, a

barren islet about $5\frac{1}{2}$ miles north-northeastward of Malören, and a 3-fathom patch marked by a **spar buoy** on its northwestern side lies about $\frac{1}{2}$ mile farther southeastward.

Numerous other dangers, some of which are marked by **spar buoys** in accordance with the uniform system, lie on both sides of the channel.

Channels—Depths.—From the vicinity of Malören a channel leads northeastward, passing between Sandskär and Gunnaren to a position about $\frac{3}{4}$ mile westward of the northern end of Seskarö-Furö, a wooded island lying about $3\frac{3}{4}$ miles east-northeastward of Gunnaren, thence trends northwestward, passing southwestward of Seskarön (sec. 10D-14) and along the northeastern side of Granön to a junction with the inner passage described in section 10D-5. A buoyed channel, also marked by range lights, leads from this inner passage to Båtskärsnäs.

Vessels of $24\frac{1}{2}$ -foot draft can proceed from Malören as far as an anchorage northwestward of Granön, thence vessels of 22-foot draft can continue to Båtskärsnäs.

Vessels can also use the channels in the approach to Kalixälv as far as their intersection with the inner passage, thence follow that passage to the branch channel leading to Båtskärsnäs.

Water level.—The highest and lowest recorded water level is about 5 feet above and below mean level. The highest level occurs in spring and the lowest in late autumn. Southerly winds cause the water to rise and northerly winds cause it to fall.

Ice usually obstructs navigation from the beginning of November to the end of May.

Aids to navigation.—Börstskär Light is shown on the southeastern point of Granön.

Two range lights are shown on the northern end of Halsö.

Västerskärsgrund Light is shown on the northern side of the channel, about $\frac{3}{4}$ mile northward of Halsö.

Two range lights are shown at Båtskärsnäs.

Gunnaren Beacon, a pole with supports and a triangular top mark, stands on Gunnaren.

Anchorage.—Vessels can anchor in a depth of about 7 fathoms, mud, about $\frac{1}{2}$ mile northeastward of the northern end of Granön. Anchorage which affords better protection from southeasterly winds can be obtained in $5\frac{3}{4}$ to $6\frac{1}{2}$ fathoms, gravel and mud, about 1 mile northwestward of the northern end of Granön.

Pilots.—See section 10D-16.

10D-13 Directions.—From a position about $1\frac{1}{2}$ miles westward of Malören Light steer for Seskarö-Furö on a course of 047° . When the beacon on Malören is in range 214° with the chapel on that island, steer with that range astern, passing between the spar buoys marking Blombäcksgrund and the 3-fathom patch southeastward of it. Maintain this course to a position about $\frac{3}{4}$ mile westward of the northern end of Seskarö-Furö and when Börstskär Light bears 308° steer for it on that bearing. When about $1\frac{1}{2}$ miles from the light, steer to pass about midway between Granön and Björn, an island lying about 1 mile east-northeastward of the northern end of Granön. When the northern end of Granön is abeam, alter course westward and proceed through the channel to Båtskärsnäs, being guided by the buoys and range lights.

Båtskärsnäs.—This loading place has an anchorage with depths of $19\frac{1}{2}$ to $24\frac{1}{2}$ feet, mud. Vessels at anchor use stern moorings and load from lighters. Loading can be completed in the channel in a depth of 22 feet. There is a wharf 82 feet long, with a depth of 13 feet alongside, and a quay about 130 feet long, with depths of 12 feet alongside. Provisions, water, and fuel oil can be obtained. A small machine shop is maintained.

LOADING PLACES AND THEIR APPROACHES BETWEEN SANGISFJÄRD AND THE FINNISH FRONTIER

10D-14 Between Sangisfjärd and Torneälven the principal loading places are Sandvik, on Seskarön, a large, dark, and wooded island lying about $2\frac{3}{4}$ miles eastward of Börstskär Light, and Haparandahamn, on the mainland, about 3 miles east-northeastward of the northeastern point of Seskarön.

Haparanda, on Torneälven, is accessible only to light draft vessels.

Channels—Depths.—A channel, available to vessels of 23½-foot draft leads from seaward to Sandvik, passing westward, north-westward, and northward of Seskarön. This channel continues eastward and northward to Haparanda; a branch channel leads to Haparandahamn. From Sandsvik to Haparandahamn the channel is available to vessels of 18 1/2-foot draft, and to Haparanda it is available to vessels of only 5-foot draft. Vessels of 11 1/2-foot draft can proceed by this channel to a position northward of Haninkari, an island about 3½ miles eastward of Haparandahamn, where a channel connects with the Finnish channels from eastward.

Another channel (see track J on Fairway Plan in section 10D-17) leads from seaward, passing eastward of Seskarön and joining the channel leading northward of that island. This channel is available to vessels of 19½-foot draft bound to either Sandvik or Haparandahamn.

Aids to navigation.—Lehtikari Light (65°-46' N., 23°41' E.) is shown on an islet lying about ½ mile northward of the northwestern point of Seskarön.

Two pair of range lights in a bight on the northern side of Seskarön lead to Sandvik.

Two range lights are shown at Haparandahamn. These lights lead through a dredged channel to berths at the loading place.

Puukko Beacon, a pole with white board-covered supports and a black rectangular top mark, stands on a rock close to Puukko, a wooded islet lying about 1¼ miles south-southeastward of the southern point of Seskarön.

Svartsten Beacon, a pole with supports covered by white boards with a red band and surmounted by a cross top mark, stands on a rock lying about 2¼ miles north-northeastward of Puukko Beacon.

Seskarklubb Beacon, a pole covered by white boards with a red band and surmounted by a diamond-shaped top mark, stands on the northernmost of several rocks lying about 1¼ miles north-northeastward of Svartsten Beacon.

Several other beacons mark the channel from Haninkari to Haparanda.

Buoys, marked in accordance with the uniform system, indicate the principal dangers adjacent to the channels.

Magnetic disturbance.—See section 10D-2.

Submarine cables are laid between Malören and Seskarön, between Seskarön and Reväsaari, and between Seskarön and Ledskären, an islet lying about ½ mile northeastward of Seskarön. Anchorage is prohibited in the vicinity of these cables.

Overhead cables extend between Seskarön and Ledskären, and across the fairway about ½ mile southward of the mouth of Torneälven.

Pilots.—See section 10D-16.

10D-15 Directions.—To approach the loading places on the northern side of Seskarön by the western approach channel, proceed as directed in section 10D-13 to a position about ½ mile northeastward of Börstskär Light, then steer toward Lehtikari Light on a course of about 050°, passing between two shoal patches, marked by spar buoys, lying about ⅓ mile and 1¼ miles south-southeastward of Björn. Passing southward of Lehtikari Light, proceed eastward and southward to Sandvik, being guided by the range light and spar buoys marking the channel.

To approach Haparandahamn by the channel eastward of Seskarön, proceed as directed in section 10D-13 with the beacon and chapel on Malören (sec. 10D-3) in range astern until nearly ½ mile westward of the western point of Seskarö-Furö, passing close northwestward of a spar buoy marking a 2½-

fathom patch lying about $1\frac{1}{4}$ miles south-westward of the southwestern extremity of Seskarö-Furö. Passing westward of Seskarö-Furö, steer to pass about $\frac{1}{4}$ mile westward of Puukko Beacon, and when Svartsten and Seskarklubb Beacons are in range 030° steer on that range which leads to a narrow buoyed channel entered westward of Svartsten. Proceed through this channel and thence north-eastward to Haparandahamn, being guided by the buoys and range lights.

If bound for Sandvik by the channel eastward of Seskarön, proceed as previously directed until northward of Seskarklubb Beacon, then north-northwestward through the buoyed channel between Seskarön and Leds-kären to the branch channel leading southward to Sandvik.

If bound for the channels northward and eastward of Haninkari, from a position northward of Seskarklubb Beacon steer for Torne-Furö, a wooded island lying about $\frac{1}{2}$ mile southward of Haninkari, and proceed through a winding channel to an anchorage off the northeastern side of Haninkari or to Haparanda, being guided by buoys and beacons.

Sandvik.—This loading place, lying about $1\frac{1}{2}$ miles southeastward of the northern point of Seskarön, has an anchorage with depths of 26 to $29\frac{1}{2}$ feet, mud, and is accessible to vessels of $23\frac{1}{2}$ -foot draft. Vessels at anchor secure with stern moorings to dolphins. Steamship Wharf has a berthing length of 59 feet with $10\frac{1}{2}$ to $15\frac{1}{2}$ feet alongside. Haparanda Quay has a berthing length at the pier head of 62 feet with 25 feet alongside; along the northern side, it has a berthing length of about 131 feet with 7 to $26\frac{1}{4}$ feet alongside. A small tug is available. Provisions, water, and fuel oil can be obtained.

During the summer a passenger boat runs between Sandvik and the south side of Rev-ässaari. There is bus service from there to Haparanda.

Granvik, a loading place close westward of Sandvik has an anchorage with a depth of

about 26 feet, mud. At Leppäniemi, adjacent to Granvik, there is a small quay with a depth of $16\frac{1}{2}$ feet alongside.

Haparandahamn.—This loading place is the port for Haparanda, which lies about 7 miles northeastward. An anchorage with depths of $14\frac{1}{2}$ to $21\frac{1}{2}$ feet, mud and clay, lies on either side of a dredged channel, $20\frac{1}{2}$ feet deep, leading to a pier. There is a depth of $19\frac{1}{2}$ feet alongside the pier for 246 feet of its length, and a depth of $11\frac{1}{2}$ feet for 115 feet. Provisions and fresh water can be obtained from Nikkala located about 2 miles northward of the port. A light is shown from the water tower in Nikkla.

Haparanda, on the west bank of Torneälven and about $1\frac{1}{4}$ miles from its mouth, is a small town at the frontier between Sweden and Finland. The channel from seaward is accessible for vessels of 5-foot draft and there are depths of $5\frac{1}{2}$ to $8\frac{1}{2}$ feet alongside some wharves. A custom house is located at Haparanda. Provisions and water can be obtained. The town is connected with the general railroad system.

PILOTS

10D-16 Pilots for the seaward approaches to the loading places at the northern end of the Gulf of Bothnia are obtained from Malören. They meet vessels about 2 miles southwestward of Malören Light. A pilot watch is maintained between the hours of 0500 and 2000.

Vessels leaving Törefjärden obtain pilots, during the day only, from Erikören, close southeastward of Karlsborg. Those leaving Karlsborg and loading places in its vicinity also obtain pilots from Erikören. Those leaving Seakaron and Haparandahamn obtain pilots, during the day only, from Erikören.

Pilots for the inner route between Luleå and Haparanda can be obtained from Luleå and Erikören.

For general information regarding pilotage in Swedish waters, see section 1-25.

ANCHORAGES

10D-17 Rånefjärden.—See section 10D-6.
Northwestward of Skagsudde.—See section 10D-7.
Törefors.—See section 10D-8.
Töre Hamn.—See section 10D-8.
Northward of Repskärsgrund.—See section 10D-10.
Rossörssund.—See section 10D-10.
Karlsborg.—See section 10D-11.

Axelsvik.—See section 10D-11.
Off Granön.—See section 10D-12.
Off Letpa.—In 6 fathoms, mud, northward of Letpa, an islet lying about $\frac{3}{4}$ mile southwestward of Seskarklubb Beacon.
Near Seskarklubb Beacon.—In $5\frac{1}{2}$ to 8 fathoms, sand and mud, westward or northward of the beacon.
Off Haninkari.—In $3\frac{3}{4}$ fathoms, mud, close off the northeastern side of the island.

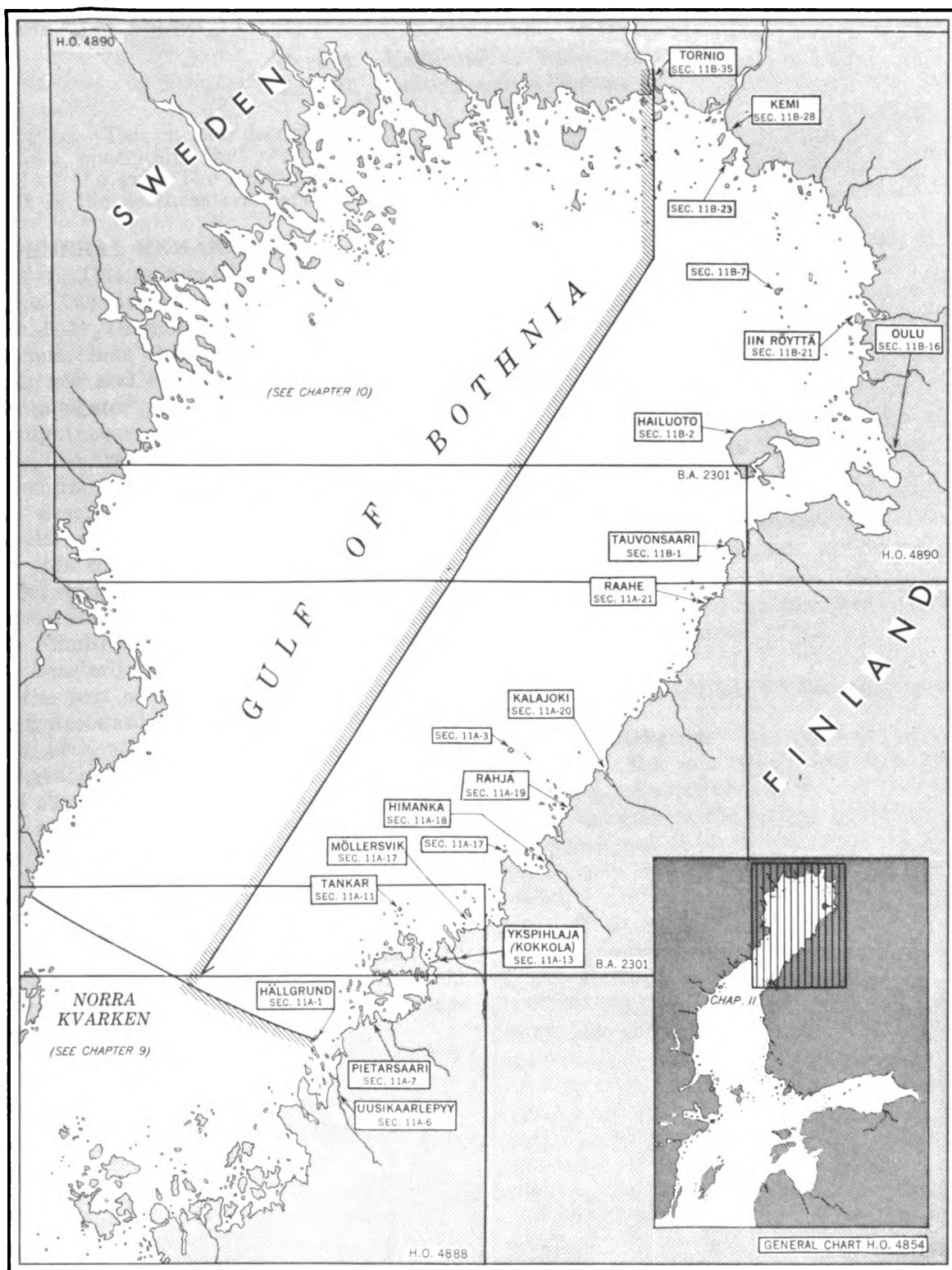


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Navy Hydrographic Office.
Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 11—GRAPHIC INDEX

CHAPTER 11

WEST COAST OF FINLAND FROM HÄLLGRUND TO THE SWEDISH FRONTIER

Part A. Hällgrund to Tavonsaari

Part B. Tavonsaari to Tornio

Plan.—This chapter describes a part of the Finnish west coast bordering on the Gulf of Bothnia, specifically that section between Norra Kvarken and the Swedish frontier, at the head of the gulf. The arrangement is northward from Hällgrund, an islet lying near the coast in the northeastern part of Norra Kvarken.

GENERAL REMARKS

11-1 This section of the coast of Finland forms the eastern shores of Bottenviken (sec. 9-1), the northern part of the Gulf of Bothnia. Like the coast to the southward, it is low and has few natural landmarks; the navigator must rely almost exclusively on lighthouses, beacons, and similar aids. Also, the area has not been thoroughly surveyed. Dangers may exist outside the charted and described off-lying dangers. Strangers should proceed with caution when approaching this coast.

Between the islet Hällgrund and Tornio, a town about 138 miles north-northeastward, the Finnish coast trends first in a general northeasterly direction for about 112 miles to the port of Oulu, thence northward and northwestward for about 63 miles to the port area of Tornio. Most of the coast is fringed by close-lying islands, islets, rocks, and shoals. The recommended channels leading among these dangers to the ports and loading places are described and should be followed according to the draft. Some of the tracks are shown on a Fairway Plan in section 10D-17.

A navigational track, which can be used by vessels proceeding from Norra Kvarken to the vicinity of Tornio and Kemi, is described in section 11B-9.

Kokkola and Oulu are the principal ports. The ports of Pietarsaari, Raahé, Kemi, and Tornio are also commercially important. A number of small loading places are located along this coastal section.

ICE

11-2 Ice conditions prevail in the area covered by this chapter; for particulars and ice chartlets, see chapter 1.

MAGNETIC DISTURBANCE

11-3 Abnormal magnetic conditions are reported in several areas along this part of the Finnish coast and are described with the related coastal features.

Part A. HÄLLGRUND TO TAVONSAARI

11A-1 Hällgrund (Khelgrund) ($63^{\circ}39'$ N., $22^{\circ}25'$ E.) is a small, low islet lying about $2\frac{1}{2}$ miles offshore on the western side of the approach to the loading anchorages of Uusikaarlepyy; it is located about $7\frac{1}{2}$ miles north-northwestward of that town. Soklot-hällan, a larger islet with several small islets close off its southern end, lies close to and extends about $\frac{1}{4}$ mile southward from Hällgrund. Tuvan, a small islet, lies about $\frac{1}{6}$ mile northeastward of Hällgrund. Two spar buoys mark the edge of the shoal water which

extends up to $\frac{1}{3}$ mile northward and eastward from Hällgrund.

Hällgrund Light is shown on the northern end of Hällgrund. **Hällgrund Beacon**, a 70-foot red and white truncated pyramid with a black pointed roof and surmounted by a vane, stands near the middle of Soklothällan.

COAST—GENERAL

11A-2 The low Finnish coast trends about 88 miles northeastward between a mainland point abreast Hällgrund and the western end of Tavonsaari, a peninsula projecting about 3 miles northwestward from the coast on the eastern side of the southern approach to Oulu.

The first 30 miles of this coastal stretch is fronted by many close-lying islands, islets, and rocks and comprises the approaches to the sheltered harbors of Uusikaarlepyy, Pietarsaari, and Kokkola. Some islands and islets lie off other parts of this coast, but the greatest concentration is in the southern part. Charted dangers lie up to 13 miles off-shore. Ulkokalla, the farthest off-lying islet, is about $9\frac{1}{2}$ miles offshore. A number of fjords, bays, and coves indent the coast, and many streams discharge into the inlets. Buoys and lights mark the outer dangers. The harbor approach channels are well-marked by buoys and ranges.

Commercial ports, from south to north, include Uusikaarlepyy, Pietarsaari, Kokkola, and Raahé. A few small loading places and anchorages are also located along this part of the coast.

DEPTHS—OFF-LYING DANGERS

11A-3 The 10-fathom curve follows the irregular trend of the coast along most of this section and lies from $1\frac{1}{2}$ to 7 miles offshore, except in the vicinity of Ulkokalla and off the islet Ohtakari, about 14 miles

southward, where it lies about 11 and 10 miles off-shore. The inshore charted dangers are all within the 10-fathom curve and are described with the related coastal features. The navigational track described below leads outside the off-lying dangers and over a least depth of 10 fathoms.

Storgrund (Sturagrund), the outermost detached shoal in the approaches to Uusikaarlepyy and Pietarsaari, has a least depth of $1\frac{3}{4}$ fathoms, is marked on its northern and southern sides by spar buoys, and lies about $4\frac{1}{4}$ miles north-northeastward of Hällgrund.

A detached $4\frac{1}{2}$ -fathom shoal lies about midway between the approach channels leading to Pietarsaari and Kokkola and 4 miles off the northwestern end of the island Eugmo.

A spar buoy, moored about 9 miles north-northwestward of the island Ohtakari (sec. 11A-17) and about $9\frac{1}{2}$ miles southwestward of Ulkokalla Light, marks a 5-fathom shoal; several other detached shoals, with depths of $2\frac{1}{2}$ -to 5 fathoms, lie between this shoal and Ohtakari.

Ulkokalla ($64^{\circ}20' N.$, $23^{\circ}27' E.$), lying about $9\frac{1}{2}$ miles offshore, and **Maakalla**, about $1\frac{3}{4}$ miles southeastward of Ulkokalla, are two small barren islets, 18 feet high, that are surrounded by shoal water up to a distance of 1 mile southeastward and north-westward. A rock, with a depth of 3 feet and marked on its western side by a spar buoy, lies $\frac{1}{2}$ mile north-northwestward of Ulkokalla. A $3\frac{1}{2}$ -fathom shoal lies about $2\frac{3}{4}$ miles west-northwestward of Ulkokalla, and two shoals, with depths of $4\frac{1}{4}$ and 5 fathoms and marked on their western sides by spar buoys, lie about $1\frac{1}{2}$ miles south-southwestward and $1\frac{1}{4}$ miles north-northwestward of the $3\frac{1}{2}$ -fathom shoal.

Ulkokalla Light is shown on the northern side of Ulkokalla; a fog signal is sounded. A radiobeacon transmits from the light structure. A fishing light is occasionally shown on Maakalla.

Pohjanpauha (Pokhianpauha), a shoal with a least depth of 1.2 m (4 ft.), is located about 1 mile north-northeastward of Maakalla. Several 4.9 to 8.5 m (2 3/4 to 4 3/4 fm.) patches lie between 2 1/2 miles northward and 2 3/4 miles north-northeastward of Maakalla.

Caution.—Vessels without local knowledge should not pass between these off-lying dangers and the mainland.

Shoals, with depths of 1.2 to 9.1 m (4 ft. to 5 fms.), lie in the western approach to the port of Raahé in an area, 3 miles in diameter and marked on its outer edge by spar buoys, that is centered about 12 3/4 miles west-southwestward of the island Ulkopauha (sec. 11A-23).

Luodematala (Luole-matala), the outermost of these shoals, has a depth of 6.4 m (3 1/2 fms.), is marked on its western side by a spar buoy, and is located about 13 miles offshore and about 20 1/2 miles north-eastward of Ulkokalla Light.

Ulkonahkiainen, a shoal with a least depth of 1.2 m (4 ft.) and marked on its southwestern side by a spar buoy, lies about 12 1/2 miles offshore and about 1 1/4 miles south-south-eastward of the buoy marking Luodematala. A 9.1 m (5 fm.) patch, marked by a spar buoy, lies about 1 mile farther south-southeastward.

Itapohjanmatala (Itapokhian-matala), with a least depth of 4.9 m (2 3/4 fms.), lies about 11 miles offshore on the northeastern edge of this group of shoals and is marked on its eastern side by a spar buoy. Two other spar buoys, moored in positions about 1 1/4 miles northwestward and 3/4 mile north-northwestward of this buoy, mark the northern edges of shoals with depths of 7.6 and 9.1 m (4 1/4 and 5 fms.). A buoy, moored about 3/4 mile

south-southeastward of the buoy marking Itapohjanmatala, marks a 10 m (5 1/2 fm.) patch on the eastern edge of the area.

Ulkonahkiainen Light (64°37'N., 23°54'E.) stands on the shoal about 1 mile southeastward of Luodematala.

NAVIGATION

11A-4 From a position 2 1/2 miles north-westward of Hallgrund (sec. 9B-4), a course of 023° for 22 miles leads over a least charted depth of 22 m (12 fms.) to a position in the approach to the port of Kakkola about 5 3/4 miles northwestward of Tankar Light (sec. 11A-11); thence a course of 038° for 48 1/4 miles leads over a least depth of 18.3 m (10 fms.) to a position 2 1/2 miles northwestward of Ulkonahkiainen Light. This track passes about 1 mile westward of Storgrund, about the same distance westward of the 8.2 m (4 1/2 fm.) patch about 9 1/2 miles north-northeastward, and about 3/4 mile northwestward of the buoy marking the shoal located about 3 miles west-northwestward of Ulkokalla.

This coastal track is continued northeastward in section 11B-9.

CURRENTS

11A-5 See section 1-37.

UUSIKAARLEPPY

Position: 63°31'N., 22°28'E.
 Depths: Approach channels—to Torso roadstead, 22-foot draft; to Stora Alorn anchorage, 10-foot draft.
 Torso roadstead, 10.9 to 14.6 m (6 to 8 fms.).
 Piers, 1.8 m (6 ft.).
 Tidal rise: Negligible.

11A-6 Uusikaarlepyy (Nykarleby) inner harbor is located between the mainland and

the island Långörn (Longern) and lies about $7\frac{1}{4}$ miles southward of Hällgrund. The outer deep-water anchorage is located in the harbor approach eastward of the southern end of Torso. An anchorage for small vessels is located off the northeastern side of Stora Alorn.

Navigation.—The track between the northern entrance to Östra Kvarken and a position $2\frac{1}{2}$ miles northwestward of Hällgrund is given in section 9B-4.

Ice.—The harbor of Uusikaarlepyy is usually closed to navigation because of ice 6 to 7 months yearly. During the year 1948-49 the harbor was closed by ice on December 29 and was reopened April 28; during 1949-50 it was closed on December 29 and was reopened April 20.

A fishing light is located about 2 miles southeastward of Hällgrund.

Approach channels—Depths.—A buoyed channel, suitable for vessels with a draft of 22 feet, leads in a 190° direction for about 8 miles between a position close eastward of the buoy marking the eastern edge of the shoal extending eastward from Hällgrund and the roadstead anchorage between the southern ends of Torsö and Sandören, a smaller island to the eastward.

From this anchorage a winding channel, available to vessels with a draft of 10 feet, leads in a general southeasterly direction for about $1\frac{1}{2}$ miles to Stora Alörn anchorage.

Anchorage.—Large vessels load in Torsö roadstead. They anchor about $\frac{3}{4}$ mile eastward of the southern end of Torso (sec. 9B-23) in depths of 10.9 to 14.6 m (6 to 8 fms.) clay. This anchorage is exposed to northerly winds.

Small vessels can anchor in Stora Alorn anchorage in depths of 3.6 to 5.2 m (12 to 17 ft.), mud.

Pilots are required and can be obtained at the Masskar pilot station (sec. 11A-9).

Uusikaarlepyy (Nykarleby), a town with a population of about 1,400, is located about $1\frac{1}{2}$ miles above the mouth of Lapuanjoki (Lappo River), a small stream that discharges about 6 miles south-southeastward of Hällgrund. The exports include tar, pit props, and pulpwood. Uusikaarlepyy has railroad, telegraph, and telephone services. Piers in the inner harbor have a total length of about 407 feet and a depth of about 6 feet alongside.

PIETARSAARI

Position: $63^\circ 43'N.$, $22^\circ 41'E.$
Depths: Main approach channel to roadstead, 26-foot draft.
 Roadstead anchorage, 7.5 to 12 m (4 to 6 $\frac{1}{2}$ fms.)
 To principal pier, 7.4 m (24 ft.)
 Piers, 4.6 to 7.4 m (15 $\frac{1}{2}$ to 24 ft.).
Tidal rise: Negligible.
Port plan: See section 11A-10.

11A-7 The port of Pietarsaari (Jakobstad) is located about 8 miles northeastward of Hällgrund and $1\frac{1}{2}$ to 2 miles northward of the town of Pietarsaari, with which it is connected by road and railroad. The well-sheltered harbor area lies between the northwestern side of Alholm, a peninsula extending about 2 miles northward from the coast, and Ädön, a peninsula about $1\frac{1}{2}$ miles westward.

Navigation.—From a position about 5 miles east-southeastward of Holmöggadd (sec. 9C-2), a course of 075° for $40\frac{1}{2}$ miles, pass-

ing about $3\frac{3}{4}$ miles northward of Helsingkallan (sec. 9B-3), leads over a least charted depth of 11 fathoms to a position on the main channel approach range about 4 miles west-northwestward of Mäskär Beacon (sec. 11A-8).

Ice.—During the period 1920-31, Pietarsaari harbor was closed to navigation because of ice on dates varying between November 16 and December 8 and was reopened on dates ranging from April 15 to May 22.

11A-8 Approaches—Depths and dangers—Channels.—Storgrund, the outermost shoal in the approaches to Pietarsaari, is described in section 11A-3. Shoals and numerous islets and rocks lie in the immediate approaches to the port.

Gammalgrund, a shoal with a least depth of 1 fathom, is located nearly 2 miles eastward of Storgrund and the same distance southwestward of Mäskär Beacon. It lies on the shorebank, which extends about $3\frac{1}{2}$ miles northward to the southern approach channel from a mainland position nearly 4 miles northeastward of Hällgrund.

Nygrundet, a shoal bank with general depths of 3 to 5 fathoms and about 1 mile in extent, lies between the southern and main approach channels. Rocks lie awash on the northern part of this bank. Other spar buoys, on the southern part of the bank, mark the northern side of the southern channel, and spar buoys, moored on the northern edge of Nygrundet, mark the southern side of the main channel.

A shoal, with depths of $1\frac{1}{2}$ to 5 fathoms and on which lie Kallan (Khellsten) and Hällsten, two rocks awash, extends about $1\frac{1}{4}$ miles northward from the main channel. A spar buoy is moored on the southern edge of this shoal, and two spar buoys mark its southwestern side. Kallan Light is located on Kallan.

Örögrund, the outermost of the islands on the northern side of the main channel, is

narrow and extends about 2 miles northward from a position about $2\frac{1}{3}$ miles northwestward of the extremity of the peninsula Adön. **Helsingörar Beacon** marks the northern extremity of Örögrund. A spar buoy is moored about $\frac{1}{2}$ mile eastward of the beacon; another spar buoy is moored about 1 mile southward of that buoy. The passage between Örögrund and the islands to the eastward forms the northern approach channel.

There are depths of $5\frac{1}{2}$ to 4 fathoms, with a spar buoy moored close northward of them, about $1\frac{1}{2}$ miles west-southwestward of Helsingörar Beacon.

Helsingö, about $1\frac{2}{3}$ miles long, and the smaller Bärgrunden and Bodsö, which lie northward and southward of it, are islands that lie immediately eastward of and parallel to Örögrund.

Norra Rummelgrund, about $\frac{2}{3}$ mile east-southeastward of the southern end of Örögrund, and **Bredhällan**, about $\frac{1}{4}$ mile farther eastward, are two small islets; two lights on these islets form the main channel approach range.

Mäskär, about $\frac{3}{4}$ mile westward of the extremity of Adön, is the largest of the islets on the southern side of the harbor approach. Several islets and rocks lie close to Mäskär.

Mäskär Beacon ($63^{\circ}44' N.$, $22^{\circ}35' E.$), a 70-foot red hexagonal tower with a gray pointed roof and surmounted by a vane, stands on Mäskär. A pilot station is located near the beacon. A motor lifeboat is maintained on Mäskär. A submarine cable connects Mäskär with Adön.

Kejsargrund, on which a beacon stands, is a small barren islet about $\frac{1}{2}$ mile westward of Mäskär. **Wickmansgrund**, the northern part of the shoal extending from Kejsargrund and Mäskär, has a least depth of 1 fathom and is marked on its southern and northern sides by spar buoys. Other spar buoys mark the southern side of the southern approach channel, which passes southward of Wickmansgrund.

11A-9 The main approach channel leads in an easterly direction between the spar buoys marking the northern side of Nygrundet and those on the southern side of the shoal bank to the northward, marked by Kallan Light, and joins the entrance channel, which leads in an east-southeasterly direction for about $4\frac{2}{3}$ miles to a position about $\frac{1}{5}$ mile northward of the northern pier. A draft of 26 feet can be taken to the roadstead anchorage, and a draft of 25 feet can be taken to the northern pier. A channel, which leaves the main channel in a position about $\frac{1}{3}$ mile northwestward of the northern pier, leads to the southern pier and is available to vessels with a draft of 19 feet.

A southern approach channel, available to vessels with a draft of 20 feet, leads across the southern part of Nygrundet, thence northwestward of Kejsargrund and Mäskär, and joins the entrance channel in a position about $\frac{1}{3}$ mile north-northeastward of Mäskär Beacon. The two reaches of this channel are marked by buoys and two pairs of beacons in range 090° and 070° .

The northern approach channel, leading southward between Örögrund and Helsingö, can be used by vessels with a draft of 10 feet. It joins the entrance channel in a position nearly 1 mile northwestward of Mäskär. Buoys mark the channel; a pair of beacons in range 174° mark the outer reach.

The general depth in the anchorage northeastward of Mäskär is $8\frac{3}{4}$ fathoms; in Ädön roadstead the depths are 6 to 7 fathoms.

Landmarks.—Mäskär Beacon and Peder-söre Church spire, about $\frac{1}{2}$ mile southward of the town of Pietarsaari, are useful marks for approaching this port. A very prominent chimney, 307 feet high, stands about $\frac{1}{4}$ mile southward of Laukko Pier, and there is a conspicuous water tower in Pietarsaari. On closer approach, the cupola of Larsmo Church, on the southeastern side of the large island Luoto (Larsmo) about 3 miles northeastward of Alholm, will be seen over the trees.

Navigational aids.—Aids for the main approach and the entrance channel include two pairs of range lights and several spar buoys.

Rummelgrund Light and Bredhällan Light, on the two islets previously located, are in range 090° and mark the main approach channel.

Kallan Light is shown about $\frac{1}{2}$ mile northward of the junction of the main approach and entrance channels. A radiobeacon and a nautophone transmitting from the light are synchronized for the purpose of distance finding.

Bormästargrund Light, shown near the northern extremity of Alholm, and Hällö Light, shown in a position about $\frac{1}{2}$ mile east-southeastward, in range 109° mark the entrance channel.

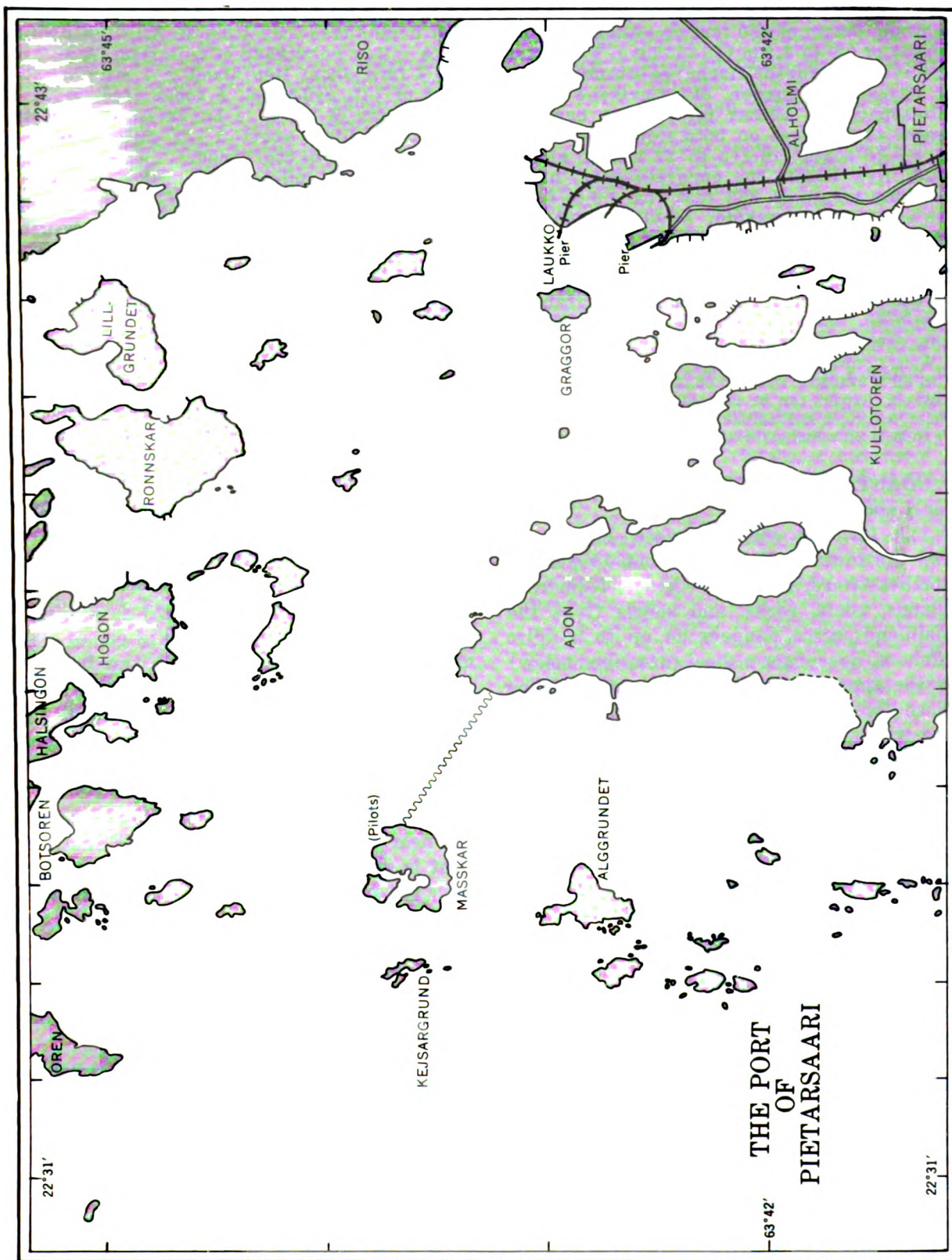
Two lights, located on and near the southern pier, in range 171° mark the channel leading toward that pier.

Anchorage.—Anchorage can be taken eastward of a spar buoy off the northern end of Mäskär in a depth of $8\frac{3}{4}$ fathoms, mud. Protected anchorage is also afforded in Ädön roadstead in 6 or 7 fathoms, mud, about $1\frac{1}{2}$ miles eastward of Mäskär. Another anchorage with a depth of 26 feet exists off Ädön.

Pilots from the Mäskär pilot station board vessels about 1 mile westward of the entrance to the main channel. The pilot boat is equipped with a radiotelephone.

Directions for entering.—Directions for the main channel only are given. Steer through the main approach channel with Rummelgrund and Bredhällan Lights in range 090° until the entrance channel comes in range 109° ; thence follow that range to the anchorages or to a position off the piers. Vessels proceeding to the northern pier pass between the inner pair of channel buoys, thence head for the pier; vessels bound for the southern pier bring the two lights leading to it in range 171° when about $\frac{2}{3}$ mile northward of the pier and follow the range, being also guided by the spar buoys on either side.

11A-10 Pietarsaari (Jakobstad), a town with a population of about 8,000, is located southward of its berthing facilities and about $7\frac{1}{2}$ miles east-northeastward of Hällgrund. It has considerable local sea-borne commerce. The principal exports are sawn wood, pit props, pulpwood, and chemical pulp. Pietarsaari is a port of entry.



Laukko Pier, the northern pier, has a berthing length of 460 feet on either side with depths of 3.9 to 8.2 m (13 to 27 ft.). Facilities are available for the discharge of tank vessels of 10,000 tons burden. Smedjevikens Lossningsspar, the center pier, has a berthing length of 492 feet on both sides with depths of 4.6 to 5.3 m (15 1/2 to 17 1/2 ft.) alongside. Nya Kajen, the concrete quay, has a berthing length of 853 feet with 3.9 to 8.2 m (13 to 27 ft.) alongside. Alholms Bron, the southern pier, has a berthing length of 361 feet with 3.9 to 6.4 m (13 to 21 ft.) alongside. All of the piers and the quay are served by the railroad. A 1 1/2-ton mobile crane is available. Tugs, a harbor icebreaker and waterboats are available.

Water, provisions, and ship's stores are procurable. Fuel oil is available; coal can be obtained by truck from Kokkola. Repairs can be effected. Pietarsaari has telephone, telegraph, and railroad services.

There is a hospital in the town.

COASTAL FEATURES (Between Pietarsaari and Kokkola)

11A-11 The coast between Pietarsaari and the town of Kokkola, about 13 1/2 miles northeastward, is very irregular. Numerous islands, islets, rocks, and shoals front the mainland; some dangers lie up to 9 miles offshore. Except for a shoal (described below) in the approaches to Ykspihlaja, the loading place for Kokkola, the charted dangers all are within the 10-fathom curve, which lies within 3 miles of the outer islands and islets. Luoto, already mentioned, Eugmo (Egmo Landet), Kåtö (Koten), and Långholm are the larger islands off this coast. Tankar, the northernmost island, lies in the approaches to Ykspihlaja about 21 1/2 miles north-northeastward of Hällgrund. A description of the outer islets and dangers along this stretch of coast follows.

Lillgrund and Storgrund, two islets about 1/2 mile apart that form the entrance of the western channel leading toward Ykspihlaja, lie about 4 1/4 miles north-northeastward of Helsingörar Beacon (sec. 11A-8). Lillgrund, the outer and smaller islet, is surrounded by shoal water. A pair of range beacons stands on each of the islets; those on Storgrund form the channel entrance range. Several 5.5 m (3 fm.) shoals lie on either side of the channel approach close southward of Lillgrund and Storgrund.

Lill Sydgrund (Lilla Zyudgrund), a shoal with depths less than 1.8 m (6 ft.), lies about 1 1/4 miles northward of Lillgrund. A 6.7 m (3 3/4 fm.) shoal lies about 3/4 mile westward of Lill Sydgrund. A rocky area, with a least depth of 2.7 m (1 1/2 fms.), lies with its outer edge about 1 1/2 miles north-northwestward of Storgrund.

Kallberg, 2 1/4 miles north-northeastward of Storgrund, is a small bare islet with a reef, having above-water rocks, extending southward from it. Other detached rocks lie within about 1 mile south-southwestward and 1/2 mile west-northwestward of Kallberg. Two beacons, forming one of the ranges for the western channel, are located on Kallberg and a rock close southward of it.

Norrgrund, with an above-water rock on it, and Stockögrund, with a least depth of 3.6 m (2 fms.), lie about 3/4 mile and 1 2/3 miles northward of Kallberg.

Koppargrund, Skataklack, and Malgrund are three foul areas, with above- and below-water rocks, that lie about 3, 3 1/2, and 4 1/2 miles north-northeastward of Kallberg.

Tankar (63°57' N., 22°51' E.) is a small island on the southwestern side of one of the main channels leading toward the harbor of Ykspihlaja and about 7 miles from the harbor entrance. Foul ground extends about 1/4 mile northwestward from Tankar; some above-water rocks lie close off its northern and southern sides.

Tankar Light is shown from a tower standing near the middle of the island. Another light is shown from a lower position on the same tower; in range 158° with a light shown on a rock close northwestward, it forms a range leading inward toward one of the lesser approaches to the main channel. A chapel, with a bell tower, stands close south-eastward of Tankar Light. A fog signal is sounded.

CABLE.—From Tankar a submarine cable runs 1 1/2 miles southward, thence south-eastward to the shore.

A lifesaving station is located on Tankar.

Tankar pilot station is located near the light structure.

11A-12 Approaches to Ykspihlaja—Off-lying dangers.—The approaches to this port lie between Tankar and Trullögrund, a small island about 5 1/4 miles eastward.

Shoals with depths of 6 1/4 and 4 3/4 fathoms lie about 7 1/4 and 4 miles north-northeastward of Tankar.

KREDENS, a shoal with a least depth of 2 3/4 fathoms and marked on its western side by a SPAR BUOY, lies about 2 2/3 miles northward of Tankar. Numerous detached 3 1/4- to 5-fathom patches lie between Kredens and Raberg, an above-water rock which lies on a shoal with similar depths in a position about 2 2/3 miles southeastward.

Patches of 4 and 4 1/2 fathoms, each marked by a SPAR BUOY, lie 1 3/4 and 2 miles northward of Tankar. A 4 1/2-fathom patch, marked by a cross spar buoy, lies about 1 3/4 miles north-northeastward of Tankar. Patches of 5 and 5 1/2 fathoms, each marked by a SPAR BUOY, lie on each side of the main channel, about 1 3/4 miles northeastward of Tankar.

HASTSKO, a 3 1/4-fathom patch marked by a SPAR BUOY, lies about 1 1/4 miles northwestward of Tankar. Maximoff, with a depth of 2 3/4 fathoms and marked by a SPAR BUOY, lies a little over 1 mile north-northwestward of Tankar and a 4-fathom patch, marked by a SPAR BUOY, lies about 1/2 mile farther northward.

VASTERBADAN, a reef awash and steep-to, lies nearly 1 mile northwestward of Tankar.

Numerous dangers, some of them marked by buoys, lie inside the described outer dangers.

BERGBADAN and LILLGRUND are two small islets that lie between Tankar and Raberg in positions about 1 1/2 miles north-eastward and 1/2 mile north-northeastward of the former.

YKSPIHLAJA

Position: 63° 51' N., 23° 01' E.

Depths: Main approach channel to harbor, 30 feet.

Approach channel to Ore Pier, 30 feet.

Harbor anchorages, 14 to 28 feet.
Ore Pier (Oil berths), 30 feet.

Tidal rise: Negligible.

Port plan: See section 11A-16.

11A-13 Ykspihlaja, the port for Kokkola (Gamla Karleby), is located about 2 1/2 miles westward of that town and about 20 miles northeastward of Hallgrund. The secure harbor lies between the mainland and the island Langholm and is protected by a breakwater. Ykspihlaja is connected with Kokkola by a railroad.

NAVIGATION.—From a position in Norra Kvarken about 5 miles east-southeastward of Holmogadd (sec. 9C-2), a course of 060° for 52 1/2 miles leads over a least charted depth of 14 fathoms to a position about 5 3/4 miles northwestward of Tankar. The coastal track (sec. 11A-4) also leads to this position. Thence steer about 100° until the Vaster Trutklippan-Harrbadan range (sec. 11A-15) indicates the beginning of the main channel.

ICE.—The harbor is usually closed to navigation on account of ice from the end of December to the beginning of May.

WINDS.—Winds from northwest, through north, to northeast sometimes cause a heavy sea in the harbor.

WATER LEVEL.—The water level may vary as much as 2 feet and is dependent on the wind. See section 1-36.

11A-14 CHANNELS—NAVIGATIONAL AIDS.—Three separate channels lead among the many islands and shoals that front the coast off the port of Ykspihlaja. They all join a common entrance channel leading into the harbor.

THE WESTERN CHANNEL, which is available to vessels with a draft of 10 feet, is the most tortuous. It is entered (sec. 11A-11) about 10 miles westward of the harbor entrance, leads through many buoy- and range-marked reaches for a total distance of about 14 miles, and joins the main channel in a position about 1 mile northward of the harbor entrance.

A NORTHERN CHANNEL, which is available to vessels with a draft of 15 feet, is entered about 400 yards westward of a spar buoy marking the northwestern edge of a shoal that extends about 1/2 mile north-northwestward from the island Trullogrund (sec. 11A-12) and leads southward and south-westward for about 6 miles through four buoy- and range-marked reaches to a position in the main channel about 5/6 mile north-northeastward of the harbor entrance.

11A-15 THE MAIN CHANNEL is available to vessels with a draft of 30 feet. It is entered about 2 1/2 miles northward of Tankar with the lights on Vaster Trutklippan, an islet about 5 1/2 miles southeastward of Tankar, and on Harrbadan, a peninsula about 2 1/2 miles northeastward of Ykspihlaja, in range 140°. Thence the channel leads for about 9 1/2 miles in a general south-southeasterly direction through several buoy- and lighted range-marked reaches to inside the break-

water, and ends at the oil wharf. Thence the channel is suitable for vessels with a draft of 23 feet to the stone wharf, and from thereon the channel has sufficient depth for vessels with a draft of 19 feet to the old wharf.

The approach channel leading to the Ore Pier, marked by buoys and a lighted range and with a depth of 30 feet, branches south-eastward from the main entrance channel about one mile northward of the seaward end of the breakwater.

HARBOR.—The harbor is about 1 mile to 1 1/3 miles wide between the mainland and the several small islands that lie close off the eastern side of Langholm, to the westward, and is about 1 2/3 miles long between the entrance at the breakwater and some islands to the southward. Several above-water rocks lie in the middle of the harbor area, which is also encumbered by a reef.

The Ore Pier (Industrial Harbor) is located about 1 mile northeastward of the shoreward end of the breakwater. The oil berths are also located at this pier.

A BREAKWATER, which protects the harbor from northerly swells, extends about 1,100 yards northwestward from the northeastern side of the harbor; a **LIGHT** is shown on the head of the breakwater. The harbor entrance lies between the breakwater head and a **SPAR BUOY**, marking the shorebank, about 1/4 mile westward.

Two **HARBOR CHANNELS**, well-marked by **BUOYS** and a pair of **LIGHTS**, in range 144° and located on the southeastern shore, lead to the anchorage areas.

MOORING BUOYS, used for stern moorings are located inside the harbor.

Anchorage can be taken inside the harbor in depths varying from 14 to 28½ feet. Vessels of 80-foot draft, with local knowledge, can anchor outside the harbor.

Pilots can be obtained from the station on Tankar. Pilots are also stationed in the harbor. Pilotage (sec. 1-24) is compulsory.

Directions for entering.—Directions for the main channel only are given. Steer through the buoyed approach channel with the lights on Väster Trutklippan and Harrbådan in range 140° until the lights on Repskär and Skörpholm come in range 160°. Steer on that alinement for about 1¼ miles to the intersection of the Klädesklippan Range Lights bearing 138° and follow that range for a little more than 1 mile until the Taulukari Range comes on bearing 161°. This buoyed reach of the channel extends for nearly 4 miles, passing eastward of Repskär and Skörpholm, until it intersects the lights of the Kråkholm Range bearing 196°, which leads between the buoys to the harbor entrance at the breakwater.

11A-16 Kekkela (Gamla Karleby), a town with a population of about 16,000, is located on the western bank of a small river that discharges into a shallow bay about 2½ miles eastward of the port area of Ykspihlaja. It has railroad, telephone, and telegraph services.

Ykspihlaja, the town in the vicinity of the port, is located along the eastern side of the harbor. The harbor office and customs office are located near the harbor. Exports consist mainly of sawn timber, paper, cellulose, ore, and various lumber products; imports are oil, coal, salt, and fertilizers.

The principal piers are: Ore Pier (The Industrial Harbor), which is also the Oil Pier, has two conveyors rated at 150 tons per hour each and pipelines to the tank farm. Ore Pier is about 400 feet long with a depth of 30 feet alongside. Stone Pier is 450 feet long with a depth of 26 feet. Ballast Quay is 170 feet long with depths of 16 to 21 feet, used for loading timber. Customs House Quay is 500 feet long with depth of 27 feet, used for general cargo and as a passenger pier. Oil Pier, southward of the breakwater, berthing space 400 feet with a depth of 30 feet. There are several smaller piers used mainly by pleasure craft. Water and provisions are available, bunkering is done by tank truck. Minor machine repairs can be made at this port. Port area is connected to the main railroad system. All loading is done alongside and there are fixed moorings for vessels awaiting berths. Tugs are available. There is an icebreaker at this port.

COASTAL FEATURES (Continued)

11A-17 The coast between the northern end of Trullö (Trulle), a peninsula projecting seaward to a position about 4½ miles northward of the town of Kokkola, and the northern end of the peninsula Lohtaja, about 13½ miles northeastward, recedes about 6 miles southeastward in the middle part. Several islands, including Renö and Birsjär, and numerous islets, rocks, and shoals lie in the bight. The coast is mostly low and wooded.

Renögrund (Poroluondonkari), the outermost island, lies 4 miles north-northeastward of Trullö. A fishing light is occasionally shown on the northern end of the island. Shoal water, with a least depth of 1 fathom, extends about ½ mile northwestward from Renögrund.

Mänttä, a 2¼-fathom shoal marked on its northwestern side by a spar buoy, is

located in the approaches to Möllersvik about 2 miles north-northeastward of Trullögrund (sec. 11A-12) and 2 miles westward of Renögrund.

Renö (Poroluoto), the largest of the islands in this vicinity, extends about $1\frac{1}{2}$ miles southeastward from a position about $1\frac{2}{3}$ miles southeastward of Renögrund.

Möllersvik (Laitakari) ($63^{\circ}56' N.$, $23^{\circ}08' E.$) is a disused loading place about $5\frac{1}{2}$ miles northeastward of Ykspihlaja. Anchorage is available here in depths of 4 to $5\frac{1}{2}$ fathoms, clay, mud, and stones, off the northeastern end of Hällskär, an island lying close to the mainland and extending about $\frac{3}{4}$ mile north-northwestward to a position about $2\frac{1}{3}$ miles southeastward of Trullögrund.

The channel leading to the anchorage is unmarked and local knowledge is essential for entering.

Pohjannauha, an above-water rock, lies about 1 mile northeastward of Renögrund. Rocks lie awash about 800 yards westward of Pohjannauha, and depths less than 5 fathoms lie up to $\frac{2}{3}$ mile west-northwestward and $\frac{1}{4}$ mile northward and eastward of the rock.

Uusipauha, an above-water rock, with some rocks awash near it, lies on foul ground about $1\frac{3}{4}$ miles east-northeastward of Pohjannauha. Shoals, with depths of 2 to 5 fathoms, lie between Pohjannauha and Uusipauha and up to $\frac{3}{4}$ mile eastward of the latter.

The shorebank eastward of these dangers extends up to $2\frac{1}{4}$ miles offshore and has depths of less than 3 fathoms in a position about $5\frac{1}{4}$ miles south-southwestward of Vattajanniemi (Vottaya-udde) a narrow point forming the northwestern extremity of the

peninsula Lahtaja.

Shoal water extends about $3\frac{1}{4}$ miles north-westward from Vattajanniemi and about 1 mile from the northern extremity of Lahtaja. Several spar buoys are moored near the outer edge of this shoal.

Ohtakari, an island about $\frac{1}{2}$ mile long east and west, lies about $\frac{1}{3}$ mile northward of Lahtaja; two beacons stand in the north-western part of the island, and a fishing light is occasionally shown on its eastern side. A pilot station is located on Ohtakari.

A lighted whistle buoy is moored on the edge of the foul ground extending about 3 miles northwestward from Ohtakari.

11A-18 Himanka (Khimango) ($64^{\circ}05' N.$, $23^{\circ}35' E.$) is a loading place about 4 miles east-southeastward of Ohtakari. It is located in the eastern part of an island- and islet-encumbered bay that indents the coast about $4\frac{2}{3}$ miles southeastward between the northern end of Lahtaja and Etäinen-nokka, a point about $4\frac{1}{2}$ miles east-northeastward.

A channel, marked by spar buoys and three pairs of range beacons, leads to the anchorages of Himanka. A draft of 24 feet can be taken to the outer roadstead anchorage, which is located on the eastern side of the channel midway between the islands Suur Mansikka and Mansikkakari and about $1\frac{3}{4}$ miles southward of Etäinen-nokka. Vessels can anchor here in depths of 4 to 5 fathoms, sheltered from all winds. A draft of $17\frac{1}{2}$ feet can be taken to another anchorage about $\frac{1}{2}$ mile southwestward of the southern end of Mansikkakari.

The outer channel reach is marked by two beacons on the southwestern side of Mansikkakari in range 113° . It leads from a position in the bay entrance about $\frac{1}{3}$ mile north-northwestward of the islet Ulkopauhakari

and midway between Ohtakari and Etäinen-nokka to the intersection of the second channel range. The second reach is marked by two beacons on the southeastern shore of the bay in range 141°. The third reach, leading to the inner anchorage and toward the village of Himanka, is marked by two lighted beacons in range 123° with a church tower.

Two pairs of light beacons northward of the town in range 108° and 133° lead into the inner harbor.

Pilots can be obtained from Tankar.

Himanka village is located at the mouth of a small stream that discharges into the southeastern part of the bay. It has a pier with a depth of 1.8 m (6 ft.) alongside; water and provisions can be obtained. There is doctor in the village.

The coast between Etäinen-nokka and Vasikkakari, a mainland projection about 7 miles north-northeastward, is indented by several small bays and coves and is fronted by numerous islands that lie up to 3 2/3 miles offshore. Foul ground extends outward from these islands for a distance of 4 miles off the mainland. A sunken rock with a least depth of 1.8 m (1 fm.) over it, about 4 1/2 miles north-northeastward of Ohtakari Light structure, is marked by a spar buoy which lies about 1/2 mile north-northwestward.

Valimatala (Veli-matala), a shoal with a least depth of 3.9 m (2 1/4 fms.) and marked on its eastern and northern sides by spar buoys, lies in the northern approach to Rahja about midway between the coast and the off-lying Maakalla (sec. 11A-3). A 1 m (3 ft.) patch, marked on its northern side by a spar buoy, lies close northward of Valimatala. A detached 6.4 m (3 1/2 fm.) patch, marked on its western side by a spar buoy, lies on the northern side of the approach range line leading toward the Rahja entrance channel. Other shoal patches, with depths of 5.5 to 9.1 m (3 to 5 fms.), lie within 3/4 mile eastward of this buoyed patch.

11A-19 Rahja (Rakhiya) (64°12' N., 23°44' E.) is a loading place near the mouth of Siiponjoki, a stream that discharges into the northern part of a bay formed between Vasikkakari and Kariniemi, a point about 2 miles southward.

Leppänen (Lepen), the northernmost of the close-lying islands off this coastal section, lies on the northeastern side of the entrance

channel about 1 1/2 miles northwestward of the western extremity of Vasikkakari. A light is shown on the northern end of the island. Two beacons in range 114° stand on the northern end of the island and mark the approach channel leading to the intersection of the range that marks the outer reach of the entrance channel.

Ryöpäs (Ryunes), about 5/8 mile southward of Leppänen, is the northern island of a group that extends south-southeastward across the bay and shelters the anchorage areas of Rahja. Other islands and islets lie in the middle of the bay and westward and northward of Vasikkakari.

The buoyed entrance channel, which leads between Leppänen and Ryöpäs, is available to vessels with a draft of 24 feet as far as the outer anchorage area northward of Ryöpäs; vessels with a draft of 15 feet can anchor in the inner anchorage eastward of Ryöpäs.

Two light beacons in range 155 1/2° stand about 1/4 mile eastward of Ryöpäs and indicate the fairway in the outer reach of the channel for a distance of about 1 mile; thence the channel continues about 2 miles farther in a general southeasterly direction.

Anchorage are indicated along the southwestern side of the channel between a position about 1/3 mile northward of the island's northern extremity and one about 1/2 mile eastward of its middle part. Rahja village is located on the eastern shore of the bay near the inner anchorage. Two 328-foot lighter piers extend from the shore abreast the village. Several lighters and low-powered tug boats are available for cargo work. Pilots are not available.

Kainu, a loading place, located about 1 3/4 miles east-southeastward of Leppänen, is available for drafts of 20 feet. From about 1 3/4 miles northwestward of Leppänen, a buoyed channel with several lighted ranges leads eastward then east-northeastward to the anchorage. A range of 185° leads through a channel, authorized for a draft of 12 1/2 feet, into Kainu harbor, south of the anchorage.

The coast between Vasikkakari and Hanhikivi (Khankhivi), a peninsula that projects about $1\frac{3}{4}$ miles seaward from a position about $23\frac{1}{2}$ miles north-northeastward, is as irregular as the coast immediately south-westward but is relatively free from fringing islands. It has only a few close-lying islets. Hanhikivi was formerly charted as an island lying about $\frac{1}{4}$ mile offshore.

All known dangers off this part of the coast, except the off-lying shoals described in section 11A-3, are contained within the 10-fathom curve, which follows the general coastal trend about 2 to 4 miles offshore. Most of these dangers lie within the 5-fathom curve and within about 2 miles offshore. Several 6 to 9.1 m ($3\frac{1}{4}$ to 5 fms.) shoals lie up to 2 miles northward and northeastward of Leppanen. A detached 7.6 m ($4\frac{1}{4}$ fm.) shoal, marked by a spar buoy, is located about $6\frac{1}{4}$ miles west-northwestward of the western extremity of Hanhikivi.

Abnormal magnetic conditions are reported in a small area which is located about 6 miles offshore midway along the coast and is centered in a position about 12 miles northeastward of Ulkokalla (sec. 11A-3).

Pertunmatala (Pertunpaukha), a small rock, lies about $1\frac{1}{3}$ miles northwestward of Puskala, a point about $9\frac{1}{2}$ miles north-northeastward of Vasikkakari. Iso Klippi Fishing Light is shown, when required, on an islet about $\frac{1}{2}$ mile north-northeastward of Puskala.

11A-20 Kalajoki ($64^{\circ}17' N.$, $23^{\circ}56' E.$) is a loading place that lies in a coastal indentation between Puskala and a point about $3\frac{2}{3}$ miles southwestward. This bay recedes about 2 miles southeastward to the mouth of Kalajoki. The anchorage, with depths of 4.5 to 5.5 m (15 to 18 ft.), is located about $1\frac{1}{2}$ miles north-northwestward of the river entrance.

The coast in the vicinity of Kalajoki is fronted by a shoal bank, with depths of 0.7 to 9 m (2 to 29 ft.), that extends about $4\frac{1}{2}$ miles northwestward from the river entrance. A 0.6 m (2 ft.) patch lies on the western edge of the shoal, about $3\frac{3}{4}$ miles west-northwestward of the river entrance.

An approach channel, which is available to vessels with a draft of 13 feet as far as the anchorage, leads south-southeastward on a course of about 168° . The track passes about $1\frac{1}{4}$ miles westward of Pertunmatala Rock and westward of Hagmani (Khagmani), a 1.7 m (5 ft.) shoal, marked on its western side by a spar buoy, that lies south-southeastward of the anchorage area. A draft of 4 feet can be taken to the river entrance.

Light beacons in range 138° are occasionally shown at the mouth of the river for the use of fishing vessels.

Pyhäjoki (Pyukha) is a shallow river that discharges into an inlet about 3 miles south-southwestward of Hanhikivi. Pyhäjoki village, where there is a church, is located about $1\frac{3}{4}$ miles southeastward of the entrance.

The coast between Hanhikivi and Kuljunniemi, a small cape on the southern side of the approaches to the port area of Raahe, trends eastward for about $2\frac{3}{4}$ miles, thence northward for about $6\frac{1}{4}$ miles. Numerous below- and above-water rocks fringe this coast, and a few islands front an inlet about $1\frac{1}{2}$ miles southward of Kuljunniemi. Kuljunlahti is an inlet that extends about $1\frac{1}{4}$ miles northwestward from Letto, an islet close off the southwestern end of the cape.

Maanahkiainen, a shoal with a least depth of 3.8 m (12 ft.) and marked on its northern, southwestern, and southeastern sides by spar buoys, lies in the southwestern approach to Raahe about $5\frac{1}{4}$ miles west-southwestward of Letto.

Peltomatala is a group of rocks that extend about $\frac{1}{3}$ mile southwestward from a position about $\frac{5}{6}$ mile southwestward of Letto. Anchorage can be taken in a depth of 7.3 m (4 fms.) about $\frac{1}{3}$ mile southeastward of the

beacon. Vessels, with local knowledge and a draft of 20 feet, can reach this anchorage through a winding, buoyed channel that leads from a position in the southern approach channel to Raahe (sec. 11A-23) about 3 miles westward of Letto. The anchorage is known as Siniluoto Roadstead.

Abnormal magnetic conditions are reported in an area about 6 miles in diameter that lies in the western approach to Raahe between Maanahkiainen and Itäpohjanmatala (sec. 11A-3).

RAAHE (BRAHESTAD)

Position: 64°40' N., 24°25' E.

Depths: Main approach channel to the outer anchorage, 25-foot draft.

To the harbor anchorage, 25-foot draft.

To Lapaluoto main pier, 25-foot draft. Anchorages, 16 to 38 feet.

Tidal rise: Negligible.

Port plan: See section 11A-25.

11A-21 The port of Raahe has two harbors. Lapaluoto, the outer deepwater harbor, is located about 2 miles southwestward of the town harbor and about 9½ miles south-southwestward of the western end of Tavon-saari. A highway and a railroad connect Lapaluoto with the town of Raahe.

Navigation.—From a position in Norra Kvarken about ½ mile eastward of Östra Kvarken Light Vessel (sec. 9C-10), a course of 049° for 99½ miles leads to a position about 2½ miles north-northwestward of Ulkonahkiainen Light; thence a course of 090° for 8¾ miles leads to a position about 1/2 mile west-southwestward of Raahe Light (sec. 11A-23). This track passes about 5 miles northwestward of the buoy marking the shoal about 3 miles west-northwestward of Ulkokalla (sec. 11A-3). The least charted depth between the light vessel and light is a

18.3 m (10 fm.) patch about 2 1/2 miles westward of Ulkonahkiainen Light. The least depth between the Ulkonahkiainen Light and Raahe Light is 11 m (6 fms.).

Ice.—The harbors of Raahe are usually closed to navigation on account of ice 5 months yearly. The use of ice breakers is difficult because of the narrow channels and the presence of a number of shoals. During the period 1930-1951 the harbors were closed on dates varying between November 17 and January 16 and were reopened on dates ranging from May 12 to June 17.

Winds and weather.—See section 1-42.

11A-22 Approaches—Depths—Dangers.—The immediate approaches to Raahe lie between Mittisaari (Smitti), a small island located about 300 yards northwestward of Letto, and Tasku, a small island about 4 miles northward. Numerous islets, rocks, and shoals front the harbors of Raahe. Some of the shoals lie up to 5½ miles offshore. Only the outermost dangers and those near the main approach channel will be described. The 10-fathom curve lies about 7 miles offshore in this vicinity.

Kalla, the northernmost islet, and Jyry, the westernmost islet, lie about ⅝ mile and 2½ miles southwestward of Tasku.

Many 4- and 5-fathom patches lie within 1¾ miles northwestward of the buoys marking the northern and southwestern sides of Maanahkiainen (sec. 11A-20).

Etelanklupu, a rock with a depth of 2.9 m (1 1/2 fms.) lies on the edge of the foul ground that extends about 3 miles westward from Kalla. Several 7.3 and 9.1 m (4 and 5 fms.) patches are dispersed in an area within 2 miles southward, 1 mile westward, and 1 1/4 miles northward of Etelanklupu.

Ampari (Emperi), a shoal with a least depth of 3.1 m (1¾ fms.), lies about 2 1/2 miles northwestward of Kalla. A 4.3 m (2 1/4

fm.) shoal is located about 1/2 mile farther northwestward. A shoal, with depths of 6.1 to 9.1 m (3 1/4 to 5 fms.) and about 1/2 mile in extent, lies about 1 mile north-northeastward of this shoal.

A dangerous wreck, marked by a spar buoy, lies sunk near the northwestern edge of a shoal, with a least depth of 3.6 m (2 fms.), in a position in the northern channel approach about 2 1/2 miles north-northwestward of Tasku.

Landmarks.—On approaching Raahe, Piehengin Vaarat, a range of hills about 10 miles south-southeastward of the town and about 7 miles inland, will be seen, and on a nearer approach, the high tower of Raahe church and the beacons on the islands fronting the town will come into view. A 360-foot chimney, marked by obstruction lights, is located about 2 1/2 miles southwestward of Raahe church.

11A-23 Harbor and channels.—The commercial part of the port of Raahe is established on Lapaluoto, a populated peninsula extending about 2 miles southwestward of the town of Raahe. Immediately southward, deep water facilities are under development for an iron ore processing plant being constructed (1963) at Rojuniemi. A pier projects from the southwestern end of the peninsula. A pier projects northward from Rajuniemi. The anchorage and berths are sheltered from northward and the town harbor from westward by a group of islands and islets lying up to 1 1/4 miles northward of Lapaluoto. The outer roadstead anchorage lies about 1 mile westward of Lapaluoto and is protected only by the shoals in the vicinity.

In 1961 the inner harbor was being dredged to an overall depth of 31 feet. The channels were being widened.

Iso Kraaseli, the principal island in the harbor area, extends about 2/3 mile northward from a position about 300 yards off the

northwestern extremity of Lapaluoto. Two beacons stand close together on the northern side of the island.

Kumpele is a barren islet lying close south-southwestward of Iso Kraaseli; a pair of range beacons stands in the northeastern part of the islet. **Hernesaari**, a small islet close southward of Iso Kraaseli, is marked by a beacon. Numerous other range beacons stand on Lapaluoto, on the shore southward of the peninsula, and on the islands and islets to the northward. These aids mark some of the approach and harbor channels.

Ulkopauha and **Maapauhakari**, two close-lying islands within 1/2 mile northwestward of Iso Kraaseli, shelter an anchorage area which is located eastward of them.

Tasku Beacon, the northernmost aid and standing on the island of that name, is a 54-foot yellow quadrangular tower with a high pointed roof, surmounted by a cross.

Heikinkari Light is shown on an islet about 4 1/4 miles southwestward of Raahe church, and **Elko light** is shown about 1 1/4 miles eastward of Heikinkari Light.

Virpipera front light is shown about 3/4 mile north-northeastward of Elko Light. **Virpipera rear light** is shown about 1/2 mile east-northeastward of the front light.

Haaga range lights are shown on the western side of Lapaluoto, about 3/4 mile north-northeastward of Elko Light.

A pair of lighted range beacons is shown in the middle of the western part of Lapaluoto and another pair of range beacons is shown on the northern side of the peninsula. Range beacons for the outer reach of the 17-foot entrance channel are located on **Kello**, an islet about 800 yards northeastward of Iso Kraaseli, and on the island **Aija Amma**, an island about 450 yards farther northeastward.

Three separate channels lead into the harbor from seaward. The main channel can be used by vessels with a draft of 24 feet as far as the main pier at Lapaluoto.

The channel leads from about one mile west-southwestward of Raahe Light, where Heikinkari and Elko Lights are in range 085 1/2°. Proceed on this range for about 3 3/4 miles until Virpipera range lights bear 063 1/2°. Follow this range until about 1/4 mile southwestward of Raahe Breakwater Light; then steer for the light bearing about 033°. When Haaga Lights come in range 081°, steer for them into Elko roads and to Lapaluoto.

Raahe Light is shown on Ulkomatala, a 6.8 m (3 3/4 fm.) shoal, located about 5 miles west-southwestward of Iso Kraaseli Beacon.

All the channels leading into the harbors are well-marked by buoys according to the uniform system (sec. 1-13).

The northern channel, which has two outer approaches and is available to vessels with a draft of 12 feet leads in a general south-easterly direction toward Roska roadstead.

Several inner channels lead through the harbor. Vessels with a draft of 11 feet can reach Tervahovi pier in the inner harbor. Vessels with a draft of 8 feet can reach Raahe by the route which passes eastward of Iso Kraaseli.

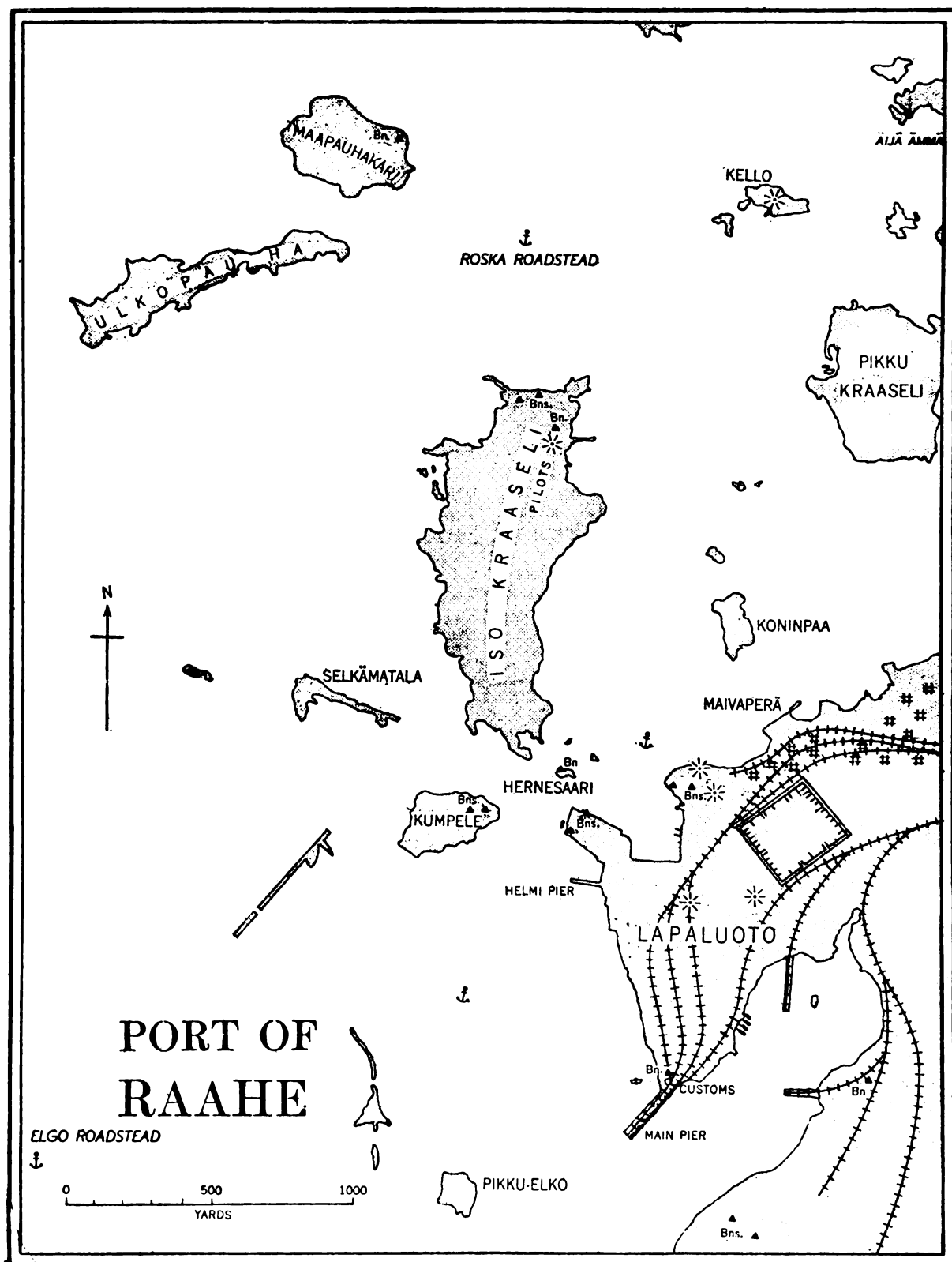
Anchorage are indicated in three places. The outer (Elgo) roadstead anchorage, located about 1 mile westward of the main pier, has depths of 10.9 to 11.6 m (36 to 38 ft.),

good holding ground. The harbor anchorage, located close northward of Lapaluoto and about 600 yards northeastward of the islet Hernesaari, has charted depths of 6 to 7 m (19 to 23 ft.). Roska roadstead has a depth of 6.4 m (21 ft.), clay, good holding ground.

Storm signals (sec. 1-17) are displayed on Iso Kraaseli.

11A-24 Vessels from seaward obtain pilots from Raahe pilot station at Lapaluoto which is equipped with a radiotelephone. Pilotage is compulsory (sec. 1-24). Pilots meet vessels in the vicinity of Raahe Light on Ulkomatala Shoal. Pilots are also available at Marjaniemi pilot station (sec. 11B-18).

Directions.—To enter Roska roadstead from southwestward through a channel authorized for a draft of 17 feet, bring the beacons on Kello and Aija Amma in range 068° and pass northward of Raahe Light on Ulkomatala Shoal. Steer on this range for about 5 miles to Roska roadstead. Vessels bound for Elko roads or Lapaluoto should turn southeastward when about 1 3/4 miles west-southwestward of Kello Light, and steer on the alignment of the leading beacons bearing 146 1/2°, located about 1/2 mile south-southeastward of Elko Light. This 17-foot channel joins the main channel close southwestward of Raahe breakwater.



11A-25 Raahe (Brahestad) is a commercial town with a population of about 7,500 (1963). It is located in the northeastern part of the harbor about 2 miles from the principal port facilities. The town harbor is shallow; commercial piers are located on Lapaluoto. It is a port of entry. Lumber, ore, and wood products are exported and are usually loaded from lighters or rafts at the anchorages. Imported cargoes are normally discharged at the piers.

Lapaluoto main pier is 410 feet long and 82 feet wide. The western berth has a depth of 18 feet along-side, and the eastern berth has a depth of 17 feet. The railroad, connecting Lapaluoto and Brahestad with the interior, terminates on the pier. Helmi Pier, about 800 yards northward of the main pier has about 300 feet of berthing length on each side; a draft of 24 feet can be taken alongside. Ore can be loaded by conveyor at a rate of 500 tons per hour at this pier. Maivapera (Old Harbor) quay, on the northern side of Lapaluoto, is about 426 feet long, has railroad connections, and can accommodate vessels with a draft of 8 feet. Berthing space available at Rojunemi is about 1,968 feet with a project depth of 30 feet along-side. Tervahovi Pier, in the town harbor about 800 yards westward of Raahe, can be reached by vessels with a draft of 11 feet. Tugs and lighters are available.

Provisions and water are procurable; coal is sometimes available. Fuel oil is available by tank truck from Oulu (sec. 11B-16). There is a small marine railway in the port capable of accommodating vessels up to 3,000 tons deadweight; the depth of water in the approach is 7 feet. Divers are available. A machine shop is located in Raahe. Both Raahe and Lapaluoto have telephone and telegraph services.

COASTAL FEATURES (Continued)

11A-26 The coast between a point about 1 mile westward of Raahe and the western extremity of Tavvonsaari, about $7\frac{3}{4}$ miles north-northeastward, recedes about $2\frac{1}{2}$ miles southeastward and forms a bight into which several streams discharge. The 5-fathom curve, extending up to $4\frac{1}{2}$ miles offshore, is the outer limit of shoals and rocks that lie off this section of the coast. Two detached 5-fathom patches lie close outside this curve.

A channel (sec. 11B-10), suitable for vessels with a draft of 6 feet, leads northeastward toward the approach to Oulu from a position in the Raahe northern channel about $1\frac{1}{4}$ miles northwestward of the islet Tasku. See track "U" on Fairway Plan in section 10D-17.

ANCHORAGES

11A-27 Uusikaarlepyy.—See section 11A-6.

Pietarsaari.—See section 11A-9.

Ykspihlaja.—See section 11A-15.

Möllersvik.—See section 11A-17.

Himanka.—See section 11A-18.

Rahja.—See section 11A-19.

Kalajoki.—See section 11A-20.

Siniluoto roadstead.—See section 11A-20.

Raahe.—See section 11A-23.

Part B. TAVVONSAARI TO TORNIO

11B-1 Tavvonsaari ($64^{\circ}48' N.$, $24^{\circ}36' E.$), a peninsula projecting from the mainland about 8 miles north-northeastward of Raahe (sec. 11A-25), is located eastward of the southern approach channel leading to Oulu.

A light, surmounted by a black rectangular daymark, is shown on the northwestern extremity of Tavvonsaari. A beacon stands on a point located about $8\frac{1}{2}$ miles northeastward of Tavvonsaari Light.

COAST—GENERAL

11B-2 Between Tavvonsaari and Oulu the coast trends northeastward for about 26 miles. A wide shorebank extends off this part of the coast, the outer edge lying about 29 miles westward of Oulu. Hailuoto, a large low wooded island nearly 13 miles wide in an east-west direction, lies on the bank about 10 miles westward of Oulu. A shoal area, with a width of about 5 miles, lies up to 37 miles westward of the port.

From Oulu the coast trends in a northerly direction for about 30 miles, thence north-westward for 35 miles to Tornio. It is low and wooded and fronted by numerous islands interspersed with rocks and shoals, the outermost lying about 30 miles offshore.

A number of rivers discharge into the gulf in this area.

DEPTHS — DANGERS — OFF-LYING BANKS AND ISLANDS

11B-3 The depths in this area are exceed-

ingly irregular and incompletely surveyed. The contour of the 6-fathom curve, where indicated on the chart, is only a rough approximation, particularly in Finnish waters.

Seljansuunmatala is an extensive shoal, with depths of less than 5.1 m (2 3/4 fm.) extending about 7 miles southwestward from Itaniemi, the southwestern extremity of Hailuoto, and from the mainland southward of it. Several detached shoals, with depths of 6.4 to 9.1 m (3 1/2 to 5 fms.), lie outside this shoal; the outermost shoal lies about 8 miles north-northwestward of Tauvonsaari Lighthouse. The westernmost edge of Seljansuunmatala is marked by a spar buoy.

Vaylansuunmatala, an 8.2 m (27 ft.) patch, lies about 4 1/2 miles west-southwestward of Marjaniemi Lighthouse (sec. 11B-14), on the western extremity of Hailuoto; spar buoys mark its northern, western, and southeastern sides.

Merikallat, a shoal area of sand and stones lying about 10 1/4 miles westward of Marjaniemi Lighthouse, has a least depth of 7 m (23 ft.); spar buoys mark its northern, eastern, southeastern, western, and southwestern sides.

An 8.8 m (29 ft.) patch about 17 miles north-westward of Hailuoto is marked on its western side by a spar buoy.

11B-4 Vähkelmi and Pallonen are two extensive shoals lying on the southern and northern sides, respectively, of the outer entrance of the western channel leading to Oulu. The outer edges of these shoals lie about 6 miles westward and northwestward of Marjaniemi Lighthouse. "*Kelmi*," a lighted whistle buoy painted black and white and four spar buoys are moored on the western side of Vähkelmi. *Peltinmatala* lighted buoy, painted red, is moored on the southern side of Vähkelmi about 2 1/2 miles southwestward of Marjaniemi Lighthouse; a spar buoy is moored close northward of the lighted buoy. Other spar buoys are moored on the northern

and southern sides of the shoal. The channel side of Pallonen is well marked by spar buoys.

11B-5 Valimatala is the outer part of a shoal extending northwestward from the northernmost point of Hailuoto and has a least depth of 4.2 m (14 ft.) in a position about 3 miles northward of Keskinielemi Light (sec. 11B-14), on the northwestern extremity of Hailuoto.

Pohjanmatala, with a least depth of about 1.2 m (4 ft.), lies on the northern side of the western channel about 4 1/4 miles north-northeastward of Keskinielemi Light; a spar buoy is moored on its southwestern side.

Liberta, a shoal with a depth of about 2.7 m (9 ft.) and marked on its northern side by a spar buoy, lies on the southern side of the western channel about 3 1/2 miles northeastward of Keskinielemi Lighthouse. A 6 m (3 1/4 fm.) patch, marked by a spar buoy on its southern side, lies on the northern side of the channel about 4 1/3 miles north-northeastward of the same light structure.

11-6 Suurhiekkä, an extensive shoal on the northern end of which there are some rocks awash, lies from about 6 1/2 to 16 miles northward of Keskinielemi Light. *Ulko Pallonen* (65°15'N., 24°44'E.), above water, lies on the southeastern tail of the shoal. The southwestern extremity of *Suurhiekkä* is marked by a spar buoy.

Kiislamatala, with a least depth of 6.8 m (22 ft.) and marked on its western side by a spar buoy, lies about 8 1/2 miles northwestward of *Ulko Pallonen*.

Kaikumatalat, with a least depth of 7.5 m (24 ft.), is a group of shoals, marked by two spar buoys, lying from 2 to 3 miles north-westward of *Kiislamatala*.

11B-7 Kaikumatalat Light Buoy is moored on the northwestern side of *Kaikumatalat* about 12 miles west-southwestward of *Ulko-krunni*.

Pitkamatala, a group of shoals with depths of about 6.3 to 9.1 m (3 1/4 to 5 fms.) and

marked at their southwestern end by spar buoys, lies between 7 1/2 to 11 1/2 miles westward of Ulkokrunni.

Kivikkomatala, with a depth of about 5.4 m (17 ft.), lies about 1/2 mile northwestward of Pitkamatala.

A 9.1 m (5 fm.) patch about 3 miles northwestward of Pitkamatala is marked by a spar buoy.

Ulkokrunni, an island with a greatest length of 1 mile, lies on a bank of foul ground that extends about 6 miles northward and southward and is located about midway between Kaikumatala and the mainland. Other small islands lie on this bank.

Santarivi, a shoal with a depth of 8.4 m (27 ft.), lies on the eastern side of the channel, for vessels proceeding from Kemi Light Buoy to the town of Kemi (sec. 11B-26), and nearly 1 mile northward of Kivikkomatala. Hietamatala, with a depth of about 8.7 m (28 ft.) lies about 2/3 mile northward of Santarivi.

11B-8 Mutkanmatala, a patch with a depth of 8.3 m (27 ft.) and with a spar buoy moored on its western side, lies about 1 2/3 miles northward of Hietamatala.

Kemi Light Vessel (65°26'N., 24°13'E.) is moored in the main approach to Kemi. A fog signal is sounded and a radio telephone is operated from the light. Pilots are stationed on board when the vessel is on station.

A chain of shoals extends about 10 miles southeastward from Mutkanmatala and includes Niska, with a depth of 8.3 m (27 ft.), Plevna, with about 1.2 m (4 ft.) and Ruumiinmatala, with 1.3 m (4 ft.). Nukkujanmatala, with a depth of 7.6 m (25 ft.) and marked on its western side by a spar buoy, lies about 1 2/3 miles northeastward of Mutkanmatala. A 9.8 m (32 ft.) patch and an 8.8 m (29 ft.) patch lie about 3/4 mile and 2 1/4 miles northwestward, respectively, of Nukkujanmatala. Pellonia, a shoal with a depth of 3.5 m (11 ft.), lies about 2 miles eastward of Nukkujanmatala.

The depths and dangers in the approaches to the ports of Kemi and Tornio, are described in sections 11B-22 and 11B-34.

NAVIGATION

11B-9 From a position about 5 1/2 miles east-southeastward of Holmögadd (sec. 9C-4), a course of 041 1/2° for about 126 miles leads to the outer approach to the western channel, for vessels with a maximum draft of 23 feet, leading to Oulu.

This track leads over depths of not less than 10 m (5 1/2 fm.) and westward of Merikallet (sec. 11B-3), the outermost danger off the port.

Vessels wishing to make a more inshore approach to Oulu may, from the position about 5 1/2 miles east-southeastward of Holmögadd, steer 049° for about 97 1/2 miles to a position 2 1/2 miles northwestward of Ulkonahkiainen Light (sec. 11A-4), thence 024° for about 32 1/2 miles to the outer part of the main channel leading to Oulu. This track leads over depths of not less than 10.9 m (6 fms.) and passes eastward of Merikallet and westward of "Kelmi" lighted whistle buoy (sec. 11B-4).

Vessels bound to the ports of Kemi or Tornio may, from the position about 5 1/2 miles east-southeastward of Holmögadd, steer a course of 036° for 140 miles to Kemi Light Vessel (sec. 11B-8), which is on station in the outer approach channel to Kemi and Tornio. This track clears all dangers and leads over depths of not less than 32 feet.

APPROACH CHANNELS LEADING TO OULU

11B-10 The channels leading to Oulu are of varying depths and direction. See Fairway Plan in section 10D-17. *

A main channel, available to vessels having a maximum draft of 26 feet, leads from the Tornio-Kemi area to the open roadstead off the port of Oulu and its outpost Toppila, about $1\frac{1}{2}$ miles north-northwestward; a channel, for vessels with a draft of 18 feet, continues to Toppilan Satama. Several branches of the main channel lead to loading places in the vicinity of Oulu that are available to vessels having respective drafts of $18\frac{1}{2}$, 17, 15, and 5 feet.

A channel from seaward, for vessels with a maximum draft of 18 feet and passing between Valikelmi and Pallonen (sec. 11B-4), joins the main channel about $10\frac{1}{2}$ miles northwestward of Oulu.

A channel from seaward, for vessels with a draft of not over 26 feet and passing between Valimatala and Pohjanmatala (sec. 11B-5), connects with the afore-mentioned channel, for vessels of 18 feet draft, at a position about $3\frac{1}{2}$ miles north-northeastward of Keskinieimi.

A channel from southwestward for vessels with a maximum draft of 14 feet, leads westward of Hailuoto and connects with the channel for vessels with an 18-foot draft about $3\frac{1}{4}$ miles north-northwestward of Marjanieni; about $4\frac{1}{4}$ miles northeastward of Keskinieimi a channel, for vessels of 8-foot draft, branches from the main channel and rejoins it at a position about 12 miles farther east-southeastward.

Abnormal magnetic conditions are indicated in the southwestern approach to the southern channel from seaward.

A channel, available to vessels with a draft of 6 feet, leads along the southeastern side of Hailuoto and joins the channel for vessels of 8-foot draft in a position nearly 3

miles eastward of the eastern extremity of Hailuoto.

Only the two principal channels, those available to vessels with a draft of 26 feet and 18 feet, will be described with the aids that mark them.

NAVIGATIONAL AIDS

11B-11 Main (northern inner) channel.— See track "P" on Fairway Plan in section 10D-17.

The channel branches off from Kemi main channel (sec. 11B-26) at a point about $2\frac{1}{2}$ miles west-southwestward of Keminkraaseli Light (sec. 11B-23), and leads southeastward as described in section 11B-26 for about $13\frac{1}{4}$ miles to a position about $1\frac{1}{2}$ miles north-northwestward of Pohjanletto beacon. At this point Maakranni Light, shown on an island about 4 miles northeastward of Ulkokrunni, bears 103° .

This bearing leads through the channel for about $2\frac{1}{4}$ miles to a position about $3\frac{1}{4}$ miles from Maakranni Light, where Kraasukanletto Light, shown on a small shoal about $2\frac{3}{4}$ miles southeastward of Ulkokrunni, bears 167° .

This latter bearing leads through a reach for about 5 miles to a position about $\frac{1}{2}$ mile northward of Kraasukanletto Light, thence 144.5° until two beacons, located in the northeastern part of Ulkokrunni, come in range 321° . The northern beacon is 39 feet high and consists of a white triangular framework structure, surmounted by a white pyramidal framework structure. The other beacon is also 39 feet high, stands about $\frac{1}{4}$ mile southeastward, and consists of a white triangle, point up, surmounted by a spar with a white pyramidal shape.

11B-12 Pohjanletto Beacon, standing on a rock on the northern part of the foul ground

that extends from Ulkokrunni, is a useful aid for rounding that shoal. The beacon is 36 feet high and consists of white uprights surmounted by a red cask.

The two beacons on Ulkokrunni in range astern lead through the next reach for about 2 miles to a position where Satakari Light, located on the northwestern side of an island about 8 1/2 miles southwestward of Krasukanletto Light, bears 118°. A beacon, 30 feet high, consisting of a white rectangle on supports, with a red vertical patch in the middle, located on the island Satakari about 1/4 mile eastward of the light, and in range 118° with a chimney about 3 1/4 miles southeastward, also marks a reach, which is about 4 miles long.

The next reach of the channel, about 2 miles long, with Kriisi Light in range 148°, the light is located near the western end of the island Kriisi about 1 1/2 miles south-southwestward of Satakari Light.

Kropsu Light, shown on the northern end of the small island Kropsu about 5 1/2 miles southward of Kriisi Light and bearing about 176°, leads through the next reach or the channel for 2 miles to a position where Rivinletto Light and Rivinnokka Beacon come in range about 123°.

Rivinletto Light is shown on a reef located about 2 3/4 miles south-southeastward of Kriisi Light; Rivinnokka Beacon stands on the mainland about 1/2 mile southeastward of the light.

This latter range leads to two positions, about 1/4 mile apart. The nighttime track is about 1 1/3 miles long and leads to a position about 5/8 mile northwestward of Rivinletto Light, where Kropsu Light bears about 193°. This bearing marks the next stretch of the channel, which is about 3/4 mile long. The next reach is also about 3/4 mile long and is marked by Rivinletto Light bearing about 076° astern. Keskihiuvet Light, shown on an

island of that name about 1 3/4 miles southwestward of Kropsu Light, in range 201°, marks the next 1 1/4 miles of the track to a position about 1 2/3 miles north-northwestward of Kropsu Light. The daytime track, leading from the Rivinletto—Rivinnokka range, is 2 1/2 miles long and is marked by two beacons on Hoikkahiuvet and Hiuvet, two islands located close northeastward and southwestward, respectively, of Keskihiuvet, in range 206 1/2°.

Virpiniemi Lights, two lights about 1/3 mile apart and in range 149°, mark the next channel reach. The front light is located on a mainland point about 1 1/2 miles south-southeastward of Kropsu Light. This reach is about 2 2/3 miles long and intersects the Isoniemi range in a position about 1/3 mile northwestward of Virpiniemi front light.

11B-13 Isoniemi Lights, located 1 mile and 1 1/3 miles northward of Virpiniemi front light, are in range 018° astern when marking the channel reach. A daytime mark for this 1-mile long reach is a beacon, on the western end of the island Kotakari about 2 1/4 miles south-southwestward of Virpiniemi front light, in range 198° with a beacon on Laitakari, an islet about 2 3/4 miles farther south-southwestward.

The next channel reach is about 2 1/2 miles long and is marked by two ranges. Vehkaperä Lights, standing on a small peninsula about 1 2/3 miles east-southeastward of Virpiniemi rear light, are in range 090° astern when marking the first half of this reach. Hanhikari Light, shown on a rock about 1 1/4 miles southwestward of Keskihiuvet Light and bearing 274°, marks the second half of the reach.

The two easternmost beacons on Keskihiuvet and Hoikkahiuvet in range 035° astern mark the next reach, which is about 1/2 mile long.

Hanhikari Range Lights (143°-323°) in range 323° astern marks the next 1 3/4 mile reach,

which continues to a position where Erkinletto range lights are in range 103° . The two lights are about $1\frac{1}{2}$ mile apart; the front light being located about $3\frac{3}{4}$ miles east of Santoseukari rear range light (sec. 11B-14).

This latter reach leads for 1 mile to a position where the lighted beacon on the island Löyhä, located about $1\frac{3}{4}$ miles south-eastward of the island Hiuvet, comes in range 321° with the lighted beacon on the islet Rautalleto, about $\frac{1}{2}$ mile northwestward. This lighted range astern marks a $3\frac{2}{3}$ -mile reach of the channel to a position on the inner approach range nearly 4 miles west-northwestward of Hietasaari Light.

Hietasaari Light, shown on the western side of Hietasaari, an island about $1\frac{1}{2}$ miles west-northwestward of the town of Oulu, in range 106° with Oulu Lutheran Church leads through this inner main channel reach to a position about $1\frac{1}{2}$ miles from the light. From this position the other inner channels lead toward the anchorage westward of the town, to the northward to Pateniemi roadstead, and to Toppilan Satama. A branch of the main channel, leading for $1\frac{3}{4}$ miles toward the deep-water anchorage, leaves the Hietasaari—Oulu Lutheran Church range about $2\frac{3}{4}$ miles from the light. This track is marked by lights in range 124° located about 1 mile southwestward of Oulu.

11B-14 Western channel.—See track "R" on Fairway Plan in 10D-17. A secondary channel from seaward, leading in between the shoals Valikelmi and Pallonen (sec. 11B-4), is about 21 miles long between its entrance, close northward of a spar buoy moored about $6\frac{1}{2}$ miles northwestward of Marjaniemi Light, and a position about 1 mile southeastward of Hanhikari Light, where it joins the main (inner) channel leading toward Oulu.

Marjaniemi Light ($65^{\circ}02'N.$, $24^{\circ}34'E.$) is shown on the western extremity of the island Hailuoto. An auxiliary light is shown from a lower level of the same structure and a radiobeacon transmits from the light house. Another light is located close north-northeastward of Marjaniemi Light. A pilot station is located near the light structures.

Keskinieimi Beacon, on the northwestern extremity of Hailuoto, is 62 feet high and

consists of a pyramidal structure on a supporting base, with a roof surmounted by a ball; the lower part of the beacon is white, the upper part is red, and the roof and ball are white. **Keskinieimi Light** is shown from a tower close eastward of the beacon. Another beacon, consisting of a white quadrangular shape, with a red vertical patch, on supports, and 36 feet high, stands close southward of Keskinieimi Light.

Oulu Light 1 marks the northeastern side of a 7.8 m (25 ft.) patch on the southern side of the main channel about $7\frac{3}{4}$ miles north-northwestward of Keskinieimi Light.

Oulu Light 2 marks the northeastern side of an 8.5 m (28 ft.) patch on the southern side of the main channel about 6 miles north-northwestward of Keskinieimi Light.

Oulu Light 3 marks the southeastern side of a 7.1 m (23 ft.) patch on the northern side of the main channel about 4 miles northward of Keskinieimi Light.

Hyypänmäki Light is shown on a hill in the northern part of Hailuoto nearly 4 miles east-southeastward of Keskinieimi Light. The two lights in range 105° with Keskinieimi Beacon mark the outer, or approach, reach of the channel.

The second channel reach is $2\frac{1}{2}$ miles long and leads in a $066\frac{1}{2}^{\circ}$ direction to a position about $1\frac{3}{4}$ miles northward of Keskinieimi Beacon, where Marjaniemi Light and the light close northward of it come in range 206° . These two lights in range astern mark the third reach of the channel, which is $1\frac{1}{4}$ miles long.

Keskinieimi Light, in range 184° astern with a beacon about $\frac{1}{4}$ mile southward, marks the $\frac{2}{3}$ -mile length of the fourth reach and leads to a position about $3\frac{1}{2}$ miles northward of Keskinieimi Light; thence a course of 068° for about $1\frac{1}{2}$ mile; when Hildenniemi range beacons bear 126° steer 115° for about $1\frac{1}{3}$ miles, where Santosenkari Lights come in range 106° .

Santosenkari front light (sec. 11B-13) is shown on an islet about $6\frac{1}{4}$ miles east-northeastward of Hyypänmäki Light; the rear light is shown from a position about $1\frac{1}{3}$ miles east-southeastward of the front light. This range marks the fifth channel reach for about $3\frac{1}{4}$ miles to a position where Luodematala Light, shown from a position

about 4 1/2 miles north-northwestward of Santosenkari front light, and LANSILETTO LIGHT, shown on an islet about 1 1/2 miles east-northeastward of Luodematala Light, are in range 062°.

The sixth channel reach, 2 1/3 miles long, leads to a position about 3 1/3 miles southwestward of Luodematala Light and the intersection of the Kattilankalla range.

Kattilankalla forward light, shown on an islet about 1 3/4 miles southward of Luodematala Light, and Kattilankalla rear light in range 095° about 1 1/2 miles eastward of the forward light marks the seventh reach of the channel, which is 2 1/2 miles long.

The eighth reach of the channel, which is about 5/6 mile long, is marked by Santosenkari Nordvastra front range light in range 148° with Santosenkari front range light, located about 1/3 mile south-southeastward. This range leads to a position about 2 1/4 miles northwestward of that light, where Loyha Light, shown on that island (sec. 11B-13) in a position about 3 miles east-northeastward of Santosenkari front light, bears 110°.

This latter bearing leads through the ninth reach for about 3 1/4 miles to the intersection with the main (inner) channel. Other channels, branching off from the described channel, are marked by lighted and unlighted range beacons.

The principal channel from seaward, (see track "Q" and "T" on Fairway Plan in sec. 10D-17) available for 26-foot draft, leads from seaward and joins the described channel in a position about 3 1/2 miles northward of Keskinniemi Light.

When approaching from the southwest, steer 042° to arrive at a position about 3/5 of a mile northwestward of Oulu Light 1; thence steer 114.5° for a reach of about 2 1/2 miles, until Oulu Light 2 is to the southward about 1/4 mile; thence, on a course of 140° for about 2 1/2 miles; with Oulu Light 3 about 2/5 mile eastward steer course 115°; when Santosenkari light beacons in range, proceed as previously described.

In addition to the lights and beacons, all the channels are well-marked by SPAR BUOYS.

ITANIEMI BEACON, a 98-foot red iron framework structure surmounted by two black rectangular marks, stands on the

southwestern end of Hailuoto about 5 miles south-southeastward of Marjaniemi Light.

HANNUKSENNIEMI BEACON, a 39-foot white pyramidal structure surmounted by a staff and ball, stands on the western side of Hailuoto about 5/6 mile south-southeastward of Marjaniemi Light.

A pair of LIGHTS in range 107 1/2° is occasionally shown on Marjaniemi when required by the pilots stationed there. This range leads through a 3 1/2-foot channel.

OULU

Position: 65° 01' N., 25° 28' E.
 Depths: Approach channels from seaward; 14 feet, 18 feet, and 26 feet.
 Anchorage: 21 to 40 feet.
 Harbor channels to:
 Toppilan Satama, 20 feet.
 Nuottasaari, 21 feet.
 Vihreasaari (oil berth) 26 feet.
 Inner harbor, 5 feet.
 Quays:
 Toppilan Satama, 15 to 24 feet.
 Nuottasaari, 21 feet.
 Vihreasaari (oil berth) 26 feet.
 Tidal rise: Negligible.

11B-16 The port of Oulu is located about 10 miles eastward of the island Hailuoto and about 113 miles northeastward of Hallgrund. Oulu lies at the mouth of the Oulujoki. The port is divided into the following harbor areas: the inner harbor, Toppilan Satama, Nuottasaari, the oil berths at Vihreasaari, and Pateniemi Harbor. An offshore oil berth is located at Virpinieni, about 7 miles northwestward of the Toppilan Satama area.

NAVIGATION.—See section 11B-9.

ICE.—The port of Oulu is normally closed 5 1/2 months a year because of ice. Strong winds form pack ice, which further aggravates the situation. Over a 20-year period (1930-50) the port was closed by ice on dates ranging from November 15 to January 14 and reopened on dates varying from May 4 to May 29.

11B-17 DEPTHS.—See section 11B-10 for the depths in the several indicated approaches to the port. No deviation from these chan-

nels is advisable as shoals and foul ground abound in this area and in many instances lie just off the designated track.

There are depths of 6 to 11 1/2 fathoms in the roads 1 1/2 to 2 miles west-northwestward of the town, but they decrease rapidly as the mainland is approached.

LANDMARKS.—The Lutheran Church at Oulu and a 446-foot chimney on Nuottasaari, southwestward of the town, are conspicuous in the approach to the port.

NAVIGATIONAL AIDS.—Koskela Light (65° 03' N., 25° 25' E.) is shown on the mainland about 3 miles north-northwestward of Oulu Church.

A light is shown on the south side of Rapakari, an island about 3 miles north-northwestward of Koskela.

Kalimenaja Light is shown on the mainland about 1/2 mile northward of Rapankari light.

A pair of lights in range 087° is situated about 5/6 mile south-southeastward of Koskela Light.

A light is shown on the northern extremity of Mustasaari, the northwestern entrance point of the harbor.

A pair of lights, the front situated about 1 1/6 and the rear about 1 1/3 miles south-southeastward, respectively, of Koskela, are in range 115°.

A pair of lights in range 087° is shown on the mainland about 1 1/4 miles south-southeastward of Hietasaari Light. A pair of lights in range 124° is shown on the mainland about 3/4 mile southward of the above range lights.

A lighted buoy, painted red, is moored about 1 1/4 miles southwestward of Hietasaari Light and a light buoy, painted red, is moored about 1 1/4 miles southward of the same light.

11B-18 HARBOR.—Toppilan Satama is entered between the mainland and Mustasaari. An overhead cable, with a vertical clearance of 164 feet, spans the channel close inside the entrance. Quays line both sides of the harbor area. A railroad bridge about 1 mile south-eastward of the entrance limits the harbor

area. Small craft can proceed beneath the bridge into the inner harbor which is used exclusively by pleasure craft.

Vihreasaari, the oil terminal, lies about 2 miles southward of the entrance to Toppilan Satama and Nuottasaari about 3/4 mile southeastward of the oil terminal. From Nuottasaari a 5-foot channel leads into the inner harbor.

Pateniemi lies about 3 miles northward of the entrance to Toppilan Satama.

Extensive construction is planned in the Vihreasaari and Nuottasaari harbor areas (1965).

ANCHORAGES.—Vessels can anchor in the open area westward of Oulu in depths of 36 to 40 feet, clay, and also up to 1 mile southward of that area in depths decreasing to 21 feet. Vessels, with a draft of 23 feet, can take anchorage off Pateniemi, about 2 miles north-northwestward of Koskela Light, in depths of about 27 feet, clay. The track to Pateniemi anchorage is marked by Rapankari Light (sec. 11B-17) and Kalimenaja Light (sec. 11B-17) in range 354°.

PILOTS.—Pilotage is compulsory and necessary in these waters. The channels leading to Oulu all pass through areas encumbered with shoals, and local knowledge is required. Pilots can be obtained from Marjaniemi or at the seaward end of the channels in that vicinity, from Kemi Light Vessel (sec. 11B-8), or from a pilot station named Martinniemi, about 12 miles north-northwestward of Oulu. The harbor pilot station, a two-story yellow house with a flagstaff, is located near the northern end of Mustasaari.

The pilot boat and pilot station at Marjaniemi are both equipped with radiotelephones.

11B-19 DIRECTIONS FOR ENTERING.—A description of the two principal approach channels, including navigational aids, is given in sections 11B-11 and 11B-14. Directions for the inner channel leading to Toppilan Satama and the Nuottasaari harbor area follow.

Steer for Koskela Light on a bearing of 035° until the first pair of lights are in range 087°. Alter course to this bearing,

passing between the spar buoys marking the channel to a position where the second pair of lights come in range 115°. Hold this range, passing between the buoys; thence round the light on the northwestern point of Mustasaari and steer a course about midway between the island and the mainland when in the confined area of the harbor.

If bound for the Nuottasaari harbor from the outer anchorage, steer with the lights southwestward of the town in range 124°, passing southwestward of the lighted buoy about 1¼ miles southwestward of Hietasaari Light (sec. 11B-17). When the second pair of range lights come in line 087°, steer on this heading to the harbor, passing southward of the second light buoy (sec. 11B-17) and between the spar buoys marking the channel.

Two lighted ranges, located on the southern side of Vihreasaari, lead into the oil harbor on the western side of Vihreasaari.

Toppilan Satama has a total berthing space of about 9,000 feet with alongside depths of 4.5 to 7.3 m (15 to 24 ft.). A grain elevator, with a discharging rate of 70 tons an hour, and a cement elevator, equipped with a conveyor for discharging bulk cement rated at 250 tons per hour, are located in Toppilan Satama. The offshore oil berth at Vihreasaari has a depth of 7.8 m (26 ft.). It is reported that tankers of 20,000 D.W.T. with drafts up to 27 1/2 feet can use this berth (1965). Nuottasaari has alongside depths of 6.4 m (21 ft.). The ore berth is equipped with a conveyor with a loading rate of 500 tons per hour. It is reported (1965) that the ore berth is no longer in use. Pateniemi, used for the export of sawn timber, has alongside berths for coastwise vessels. Toppilan Satama has cranes with capacities of 3 to 8 tons. It is reported that vessels up to 570 feet in length and with drafts up to 26 feet can be accommodated (1965).

Tugs and lighters are available.

Coal, fuel oil, water, provisions and supplies are procurable. A shipbuilding yard and foundry are located at Oulu. A small marine railway can handle vessels of 300 tons and a draft of 12 feet. The shipyard can effect all types of repairs on board ships. The city has telephone and telegraph services.

Hospital facilities are available in Oulu.

COASTAL FEATURES (Northward of Oulu)

11B-21 From Oulu the coast trends in a northerly direction for about 30 miles and thence northwestward for 35 miles to Tornio. It is low, wooded, and fronted by numerous islands, rocks, and shoals, some of the latter lying over 30 miles from the eastern shore of the gulf.

A buoyed channel, for vessels of 22-foot draft, leading to the loading place off Martinniemi, branches from the main approach channel about ¾ mile west-northwestward of Rivinletto Light (sec. 11B-12). The channel is indicated by two pairs of range lights in Martinniemi; one range is in line 066½° and the other is in line 071°. Anchorage can be taken off Martinniemi in depths of 7.3 to 9.1 m (4 to 5 fms.). At the junction of the above channels another branch, for vessels of 18-foot draft, leads northward for about 2 1/4 miles. Pilots are stationed at Martinniemi.

Cargo facilities at Martinniemi consist of several lighters, two tugs, and three shallow draft piers. The town is connected to the general telephone, telegraph, and railway systems. A small infirmary with a doctor in attendance is maintained by the lumber company.

The loading place off Iin Roytta, an island situated about 1/4 mile northward of Satakari (sec. 11B-12), affords anchorage to vessels with local knowledge in depths of 7.3 to 9.1 m (4 to 5 fms.), well sheltered. There is also a channel for vessels with a draft of 6 feet, leading eastward of Kriisi and Satakari.

A channel, for vessels of 8-foot draft and marked by lights, buoys, and beacons, skirts the coast from a position about 1 mile westward of Iin Roytta to Koivuluoto (65°38'N., 24°50'E.), a loading place off an island of that name on the northern shore of the gulf, a distance of about 32 miles. At the outer anchorage, about 1 1/4 miles southwestward of Koivuluoto, there is a depth of about 10 m (5 1/2 fms.), sand, and at the inner anchorage about 5.5 m (3 fms.), clay. The outer anchorage is exposed to southerly winds.

Several branching channels (see track "M" on Fairway Plan in section 10D-17), leading southward and southwestward from Koivu-luoto, connect with the inner channels to Kemi and Tornio, and with the main (northern inner) channel to Oulu and the seaward tracks.

11B-22 Depths and dangers.—An extensive flat, on which are a number of islets and rocks, extends westward from the mainland to a line joining Ulkokrunni and Ykskivi (sec. 11B-23). Ulkomatala, Härkäletto (sec. 11B-11), Saapaskari, Leipare, and Pieni Leipare are groups of rocks, above and below water, lying about $6\frac{1}{2}$ to 8 miles northward of Ulkokrunni; about $1\frac{3}{4}$ miles farther northward is Tiurasenkrunni, an islet bordered by sunken rocks.

Westward of Ulkomatala are two shoals, distant 3 and $4\frac{1}{4}$ miles, having respective depths of 8.2 and 6.9 m ($4\frac{1}{2}$ and $3\frac{3}{4}$ fms.) and each marked by a spar buoy. A shoal, with a depth of about 6.4 m ($3\frac{1}{2}$ fms.) and its western and eastern sides each marked by a spar buoy, lies about $3\frac{3}{4}$ miles west-southwestward of Tiurasenkrunni; another shoal, lying about $2\frac{1}{4}$ miles west-northwestward of the same islet, has a depth of about 3.2 m (10 ft.) and is marked on its western side by a spar buoy.

Herkuleenmatala, about 5 miles west-northwestward of Tiurasenkrunni, has a depth of about 4.4 m ($14\frac{1}{2}$ ft.) and is marked on its southern side by a spar buoy; about $\frac{3}{4}$ mile farther southward is another shoal, with a least depth of about 2.8 m ($1\frac{1}{2}$ fms.) its northern and southern sides each marked by a spar buoy. About the same distance farther southwestward is a shoal with a least depth of about 7.5 m (4 fm.), marked on its northeastern side by a spar buoy.

Lallin Moyly, a shoal with a depth of 3.6 m (2 fms.), lies on the western side of the seaward approach from the southwestward about 11 miles west-southwestward of Tiurasenkrunni. An 8.5 m ($4\frac{3}{4}$ fm.) patch, marked by a spar buoy, lies about $\frac{3}{4}$ mile southeastward of Lallin Moyly.

Moylynharju, a shoal with a depth of about 6.3 m ($3\frac{1}{4}$ fms.) and marked on its eastern side by a spar buoy, lies nearly 2 miles northeastward of Lallin Moyly; a 9.8 m ($5\frac{1}{4}$ fm.) patch lies nearly midway between Lallin Moyly and Moylynharju.

Two shoals, with depths of about 7.7 and 8.1 m ($4\frac{1}{4}$ and $4\frac{1}{2}$ fm.) and each marked by a spar buoy, the former on its southern and the latter on its western side, lie about $1\frac{2}{3}$ miles south-southwestward and the same distance southwestward, respectively, of Keminkraaseli Light (sec. 11B-23). These shoals lie on the northeastern side of the approach to Kemi from the southeastward.

Valimatala, with a depth of 6.5 m ($3\frac{1}{2}$ fms.), its northern and southern sides each marked by a spar buoy, lies about $2\frac{2}{3}$ miles westward of Keminkraaseli Light. A lighted buoy marks the eastern side of a shoal, with a least depth of 1.9 m (1 fm.), about 2 miles west-northwestward of Keminkraaseli.

APPROACH TO KEMI—NAVIGATIONAL AIDS

11B-23 Ykskivi Light ($65^{\circ}36'N.$, $24^{\circ}42'E.$), is shown on the low barren islet of the same name about 13 miles north-northwestward of Ulkokrunni. Two spar buoys are moored on the southern and southeastern edges of a shoal that extends up to 800 yards from Ykskivi.

Keminkraaseli Light is shown on an islet about $3\frac{1}{2}$ miles west-northwestward of Ykskivi Light.

Ajos Light ($65^{\circ}40'N.$, $24^{\circ}31'E.$) is shown from the head of a stone quay on the western side of Ajos in a position about $3\frac{1}{3}$ miles north-northwestward of Keminkraaseli Light. A light, in range $016\frac{1}{2}^{\circ}$ with Ajos Light, is shown from the northwestern side of Ajos. Another Light, in range $016\frac{1}{2}^{\circ}$ with Ajos Light, is shown from a red and white church tower located in the town of Kemi. A light is shown on the northern end of a detached breakwater that lies off the western side of Ajos. Ajoksen Laiturinpää Light is shown from the outer end of a pier close southeastward of Ajos Light. A radiobeacon transmits on the southeastern extremity of Ajos.

Lehtikari Lights, in range 353° , are located on the southwestern end of Selkasääri, about $1\frac{1}{2}$ miles north-northwestward of Ajos Light.

A pair of lights in range 082 1/2° is shown on the western side of the town about 2 1/2 miles north-northeastward of Lehtikari Lights.

11B-24 Munakarinletto Light Beacon stands on an islet about 2 miles north-northeastward of Ajos Beacon, Laitakari Beacon and Kalkkinakka Light, about 1 and 1 1/2 miles, respectively, 038° from Munakarinletto Light Beacon, forms a range when in alinement on that bearing.

Puidenpuuttuma Light Beacons, in range about 066°, stand on the peninsula at the northeastern end of Ajos.

A beacon stands on Munakari, an islet about 2/3 mile westward of Puidenpuuttuma front range light beacon. This beacon in range with a chimney on Laitakari bears about 020°.

Tuomilahti Light Beacons, on the north-western side of Ajos about 1 1/2 miles north-eastward of Ajos main pier, when in range bear about 152°.

Mansikkanokka Light, shown on the beach at the southern part of Kemi, is in range 011° with the light in the church tower.

An aviation light (65°44' N., 24°34 1/2' E.) is shown from Kemi Town Hall about 1/2 mile east-northeastward of the range lights on the western side of the town.

Pajusaari Light Beacons in range 337° are located north-northwestward of the town and lead alongside the quays. The front light is shown from the southern side of Kiikeli, an island about 3/4 mile northwestward of Kemi Church tower, and the rear light is shown from a chimney at Pajusaari, about 1 mile farther north-northwestward.

Ajos Beacon, near the western extremity of Ajos, is a red framework, 58 feet high, surmounted by a white St. Andrew's cross and a cask.

Murhaniemi Lighted Beacon stand on Ajos close westward of its southeastern extremity; in range they bear 330°.

A pair of range beacons, about 750 yards apart, stand northward and north-northeastward of the southeastern extremity of Ajos. The front beacon is a white triangle, point up, with a red patch in the middle, on legs; the rear beacon is similar, but the triangle is point down; these two beacons are in range 336°.

11B-25 Inakari Beacon stands on an islet of that name about 1 1/4 miles southward of Ajos Beacon and consists of a 42-foot white framework structure with a red pole surmounted by a cask. Beacons in range 286° stand close southward of Inakari Beacon.

Ajoskrunni Light Beacons in range 054° stand on Ajoskrunni, an island about 1 1/4 miles southward of the southeastern point of Ajos, and lead in the approach to the anchorage southeastward of Ajos.

A beacon standing on the northwestern end of **Ropposenkari**, an islet about 1 mile eastward of the northernmost beacon on Ajoskrunni, consists of a white rectangle on a red concrete structure. A beacon, consisting of a white triangle, point up, with a red patch in the middle, on supports, stands on the eastern side of Ajos about 2 miles north-northwestward of the beacon on Ropposenkari. These two beacons are in range about 340°.

A beacon stands on an islet about 500 yards northeastward of the southern extremity of Ajoskrunni and consists of a white triangle, point up, with a red patch in the middle, on supports. A similar beacon, the triangle point down, stands near the northern extremity of Ajoskrunni. These two beacons are in range about 310°.

A beacon, 22 feet high, stands on the eastern side of Ajos close northward of the beacon in range with Ropposenkari Beacon; it consists of a white rectangle with a red patch in the middle, on supports. This beacon

in range with the Kemi Church Tower bears 348.5°.

A pair of Lighted Beacons stands on the mainland at Ruumiskari (65°39'N., 24°40'E.); they are in range 060°. These beacons are also in alignment, on a reverse bearing of about 240°, with two lighted beacons on Ajoskruuni, one of which stands on the northeastern side and the other near the center of that island.

A light beacon stands on an islet close off the mainland about 1 2/3 miles north-northwestward of the beacons on Ruumiskari; another light beacon is situated about 1/3 mile farther northward on Rytikari. These beacons are in range about 003°.

A Light Beacon, close eastward of Santonen, is in range 310° with the Light Beacon on the narrow peninsula of northern Ajos, about midway between Tuomilahti and Puidenpuuttuma beacons. The beacons are also in alignment on a reciprocal bearing of about 130° with the two Light Beacons, one of which stands on the northwestern part of an islet off Prykari, and the other on the mainland at Satamaranta.

A light beacon on Pihlajakari, an islet lying close off the eastern side of Ajos, is in range 023½° with the light on a chimney located 1½ miles north-northeastward.

The front beacon of a pair of range beacons stands on an islet about 1¾ miles eastward of the northern extremity of Ajoskrunni and consists of a white rectangle with a black, vertical, central patch, on supports, 20 feet in height; the rear beacon, 26 feet high and standing on an islet about 1 mile east-south-eastward of the front beacon, is similar to it; the beacons are in range about 106°.

11B-26 Approach channels.—See track "L" on Fairway Plan in section 10D-17. The main approach channel from seaward leads from a position about ½ mile south-eastward of Kemi Light Vessel (sec. 11B-8) on a heading of 038° for about 8 miles to a point where Ajos range lights and the light on Kemichurch tower come in range (016½°). This portion of the channel continues north-northeastward for about 6½ miles to the outer roadstead anchorage, passing eastward of the shoals Möylynharju and Välimatala and thence between the buoys marking the shoals that lie closer to the channel and up to 2½ miles south-south-westward of Ajos.

See track "P" on Fairway Plan in section 10D-17. The inner channel leading toward Oulu (sec. 11B-11) from about 1 1/2 miles north-northwestward of Pohjanletto beacon, reversed and continued northward for about 13 1/4 miles, joins the Kemi main channel in a position on the approach range about 4 miles south-southwestward of Ajos main pier. From a position on the inner track about 1 1/2 miles north-northwestward of Pohjanletto Beacon (sec. 11B-12), the channel leads west-northwestward for about 1 mile, with Maakrunni Light (sec. 11B-11) bearing 103° astern. The next channel reach is 5 miles long and is marked by Ulkokrunni Light (sec. 11B-11) bearing 144° astern. The track continues north-northwestward for about 4 1/4 miles, with Keminkraaseli Light bearing 341°, to a position between the spar buoys marking the two shoals southward of Herkuleenmatala, and thence northwestward for about 3 2/3 miles, with Harkaletto Light, shown on a rock about 6 1/2 miles northward of Ulkokrunni, bearing 121° astern, to the Kemi approach range.

11B-27 MAGNETIC DISTURBANCE.—Magnetic disturbance is reported to exist in an area indicated as having a greatest width of about 2 1/2 miles and extending up to 6 miles westward of Harkalletto.

Vessels with local knowledge bound for the anchorage at Veitsiluoto (sec. 11B-25) outer loading place eastward of Ajos, can enter a channel, marked by ranges and buoys, about 1 mile westward of Ykskivi Light (sec. 11B-23). Anchorage can be taken about 300 yards westward of the channel line in a depth of about 30 feet, sand. Vessels with a 16-foot draft can continue up to 1 1/2 miles farther inward to the loading anchorages off the southwestern side of Veitsiluoto. Wood pulp is loaded here.

A buoyed channel, marked by range beacons, with a depth of 26 feet, leads to a loading anchorage situated about 800 yards southward of the southeastern extremity of Ajos. A channel with a depth of 17 feet, marked by buoys and range beacons, branches eastward from it and connects with the channel leading to the pier and loading anchorage at Veitsiluoto.

KEMI

Position: 65° 44' N., 24° 34' E.
 Depths: Outer approach, 42 1/2 feet.
 Outer roads, 49 feet and 34 feet.
 Middle roads, 17 feet and 20 feet.
 Inner roads, 17 feet.
 Ajos approach channel, 26 feet.
 Ajos piers, 19 to 30 feet.
 Ajos oil berth, 30 feet.
 Kemi approach channel, 9 feet.
 Kemi piers, 10 to 12 feet.
 Veitsiluoto approach channel, 19 feet.
 Veitsiluoto berths, 24 feet.
 Tidal rise: Negligible.

11B-28 The port of Kemi is located at the mouth of Kemijoki, a river that discharges into the head of the Gulf of Bothnia about 138 miles north-northeastward of Hallgrund. A harbor installation on the western side of the island Ajos about 4 miles south-southwestward of the town of Kemi serves as a deep-water outport.

NAVIGATION.—See section 11B-9.

ICE.—The port is normally closed about 6 months of the year because of ice conditions. Over a 20-year period (1930-50) the port was closed by ice on dates ranging from November 15 to December 19 and reopened on dates varying from May 14 to May 30.

DEPTHS.—The main channel leading to Ajos harbor has a depth of 26 feet; depths alongside the piers range from 19 to 30 feet with 30 feet alongside the oil berth. Veitsiluoto approach channel is 19 feet deep and the pier has 24 feet alongside. The piers in Kemi inner harbor are used only by pleasure craft.

LANDMARKS.—The church tower at Kemi and a chimney at the southwestern side of the town are prominent. A chimney on Veitsiluoto and a chimney on Laitakari are conspicuous.

11B-29 HARBOR.—The deep water port of Ajos, on the western side of Ajos Island, is protected by the Eastern Mole which forms part of the oil quay and the Western Mole a detached breakwater still under construction (1965).

Veitsiluoto Harbor, located about 3 miles northeastward of Ajos Harbor, has a single, privately owned pier.

Loading places, for vessels of varying draft, are designated in the open area southward of the town. A number of islets, rocks, and shoals encumber this area.

ANCHORAGES.—There are five anchorages in the harbor area of Kemi. That in the outer roads is westward of the approach channel, with the head of the pier at Ajos bearing 028°, distant 1 mile, in a depth of about 14.9 m (49 ft.), sand; also eastward of the channel, close southward of the seaward end of the eastern breakwater in about 10.3 m (34 ft.) of water.

In the middle roads there are two anchorage areas. The first is located westward of the channel having a depth of 6.1 m (20 ft.) with the light structure on the northern end of the breakwater bearing about 198°, distant nearly 1 mile; the second is located eastward of the channel in a depth of about 5.2 m (17 ft.), with Tuomilahti front range light structure bearing about 107°, distant about 1/2 mile.

At the inner roads there is an anchorage on the western side of the main channel with a depth of 5.2 m (17 ft.), located about 1 mile bearing 239° from Laitakari beacon.

PILOTS.—Pilotage is compulsory. Inbound vessels may obtain pilots from Kemi Lightship or Ajos. Pilots from Ajos board about 7 miles south-southwestward of the breakwater at the harbor entrance.

11B-30 DIRECTIONS.—Vessels proceeding from Kemi outer roadstead to the piers in Ajos harbor should steer into the harbor on Ajos entrance range (016 1/2°), until the lights on Lehtikari (sec. 11B-23) come in range (353°), thence proceed to berth.

Vessels bound for the middle or inner roads, or the Kemi piers, head in as aforementioned, but hold the Lehtikari Range for nearly 1 mile until the Munakarinletto Light Beacon and Laitakari beacon (sec. 11B-24) come in range (038 1/2°), then steer on that

bearing for 1/2 mile until the Puidenpuuttuma Light Beacons are in range (066 1/2°) and steer for them.

During daylight a vessel can hold that heading until Munakari Beacon and the chimney on Laitakari come in line (020°) for a short leg of about 1/3 mile before swinging to the Tuomilahti Range, astern, or at night hold the Puidenpuuttuma Range until the Tuomilahti Lights are brought in line (148°) astern, and proceed to the inner anchorage. During daylight, vessels with a 10-foot draft can proceed from the inner anchorage to the Kemi piers through the buoyed channel, with Mansikkankka Light (sec. 11B-24) in range 011° with the light shown from the church tower.

11B-31 KEMI, a town with a population of about 30,000 in 1963, is situated on a small peninsula on the eastern side of the mouth of Kemijoki. The port of Kemi is important commercially for its timber products. The exports consist mainly of sawn timber, pulpwood, cellulose, wood pulp, and manufactured items.

The quays of the inner harbor at Kemi are used by pleasure craft only.

Ajos, the deep harbor for the port, has 3 piers with depths of 5.8 to 9.1 m (19 to 30 ft.) alongside. The piers are connected to the railroad system. There are two 6-ton cranes.

The oil berths, located at the southern end of the eastern breakwater, have a depth of 9.1 m (30 ft.) alongside.

The private pier at Veltsiluoto is about 1,000 feet in length with a depth of 7.3 m (24 ft.) alongside.

Minor repairs to boilers and machinery can be performed. A marine railway in the

port can accommodate vessels upto 200 tons.

Water is laid to the Ajos piers, oil and provisions can be obtained. Tug boats are available. There is telegraph communication with all parts, and steamer service to Tornio. A customs station and hospital are maintained at Kemi.

APPROACHES TO TORNIO

11B-32 Tornio is situated about 12 miles northwestward of Kemi and close to the boundary between Finland and Sweden. ROYTTA, the outer harbor of Tornio, is on the southwestern side of the island SELLEI (Sallo) about 5 miles southward of the town.

An INNER CHANNEL, marked by buoys and range beacons and suitable for vessels having a maximum draft of 1.5 m (5 ft.), leads from the town harbor at Kemi to a junction with the channel to Roytta from seaward at a position about 9 1/2 miles westward of Kemi and 1 1/4 miles southward of the southern extremity of Sellei.

There are several loading places northward of the inner track from Kemi, the channels leading to them being marked by range beacons and buoys.

11B-33 RANGE LIGHTS.—Mainua Range Lights in line bear 306°. The front light is shown on Pohjos Kraaseli, about 6 miles westward of Ajos harbor entrance, and the rear light on Mainua Islet about 1 mile northwestward of the front light.

Stor Knivskar Range Lights when in line bear 298°; the front light stands on Stora Austin, an islet nearly 2 1/2 miles westward of Mainua Islet, and the rear light on Nalkakari Rock.

Nissunletto Front Range Light in line with Stora Hamnskar Rear Range Light bear 315°.

This range is located northward of Stor Knivskar Range.

Roytta Range Lights when in line bear 347°. The front light is shown from an old wharf at Roytta and the rear light on an islet north-northwestward of the town.

11B-34 SEAWARD APPROACH TO TORNIO.—During daylight vessels with a maximum draft of 24 feet can proceed through a channel, marked by range beacons and buoys, as far as the roadstead about 1/2 mile southward of Roytta. Vessels of 20-foot draft can approach to a position immediately off the port.

See tracks "L" and "K" on Fairway Plan in section 10D-17. From the vicinity of Kemi Light Buoy, the initial approach is the same as for Kemi (sec. 11B-26) outer roadstead, but the track to the port of Tornio only holds the Ajos entrance range (016 1/2°) for about 3 3/4 miles until Mainua Range Lights are in line 306°. The channel is marked by this range for about 2 3/4 miles. The next reach is about 4 miles long and is marked by Stor Knivskar Range Lights in line 298°. Nissunletto and Stor Hamnskar Lights in range 315° mark the next reach, which is about 1 1/4 miles long and leads to a position where Roytta Range Lights come in line 347°. This latter range leads toward the port.

TORNIO

Position: 65° 51' N., 24° 09' E.
 Depths: Roytta approach, 7.3 m (24 ft.).
 Roytta anchorage, 6.7 to 7.3 m (22 to 24 ft.).
 Roytta quay, 6.1 m (20 ft.).
 Tidal rise: Negligible.

11B-35 The port of Tornio has two harbors. The inner, or town, harbor is shallow.

The main commerce of the town is handled through Roytta, the deep-water outport, which is located about 5 miles southward of the town and 10 miles westward of Kemi.

NAVIGATION.—See section 11B-9.

ICE.—The port of Tornio is normally closed about 6 1/2 months of the year. Over a 20-year period (1930-50) the port was closed by ice on dates ranging from October 29 to November 30 and reopened on dates varying from May 11 to June 24.

DEPTHS.—The depths in the seaward approach to the port of Tornio are variable, but a least depth of about 30 feet is found up to within 2 miles of the port, and a least depth of 22 feet up to the port.

LANDMARK.—A chimney at Roytta is conspicuous in the approach to the port.

11B-36 HARBOR.—Roytta Deep Harbor, at the southern end of Sellei (sec. 11B-32), is formed by a pier constructed on caissons that extends southward and southwestward from the island; it is open to the westward. Roytta Old Harbor, on the southwestern side of Sellei, is formed by breakwaters.

ANCHORAGE.—Anchorage in the roadstead is close eastward of the indicated channel in a depth of about 24 feet, good holding ground, with the head of the pier at Roytta bearing about 354° distant 800 yards. There is anchorage off the pier at Roytta Deep Harbor in about 22 feet of water; there is a 20-foot depth about 200 yards off.

11B-37 PILOTS.—Pilotage is compulsory and pilots can be obtained from Kemi Light Vessel or at the pilot station at Ajos (sec. 11B-29). The pilot station at Roytta is situated on Rayha, an islet close southeastward of the southern extremity of Sellei.

DIRECTIONS.—See section 11B-34 for a description of the main approach channel and its aids.

Vessels proceeding to the pier at Roytta should approach on the port range (347°)

until abreast the head of the pier and then steer directly for it, passing between the buoys as indicated.

11B-38 TORNIO is a town with a population reported to be about 3,000 in 1949. It is situated on the western bank of Torniojoki about 1 1/2 miles above the river mouth. Haparanda (sec. 10D-15), a Swedish town close southward, is separated from Tornio by the border and a small inlet from the river. A railroad connects Tornio with Roytta Deep Harbor; the tracks extend to the head of the pier. A customs station is located at Roytta. Outward clearance is obtained at Tornio.

There is a berthing length of about 512 feet at the pier at Roytta Deep Harbor, with a depth alongside of 21 feet. At Roytta Old Harbor there is about 722 feet of quayage with depths of 6 1/2 to 11 feet alongside. Deeper-draft vessels are loaded at the anchorage from lighters.

Timber products and pulpwood are the principal exports.

Provisions can be obtained. Water and fuel oil are supplied by tank car on the pier at Roytta. There is a hospital in Tornio.

The port is connected to the general telephone, telegraph, and railway systems. Radio traffic is handled at Kemi and Lulea. There is steamer service to Kemi and other Baltic ports.

ANCHORAGES

11B-39 OULU.—See section 11B-18.

IN ROYTТА.—See section 11B-21.

HALONEN.—See section 11B-21.

MARTINNIEMI.—See section 11B-21.

KOIVULUOTO.—See section 11B-21.

VEITSILUOTO.—See section 11B-27.

AJOS.—See section 11B-29.

KEMI.—See section 11B-29.

TORNIO.—See section 11B-36.

APPENDIX

CLIMATOLOGICAL TABLES

(U. S. Weather Bureau)

TALLINN, ESTONIA.—Lat. 59°27' N., long. 24°45' E., elevation 15 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.91	29.88	29.88	29.91	29.97	29.88	29.82	29.82	29.91	29.94	29.88	29.88	29.88	30-32
<i>Temperature</i>														
Average, °F.....	22	22	26	36	47	57	63	60	53	43	33	27	41	95-98
Average highest each month, °F.....	38	37	44	60	74	75	82	77	69	58	48	40	83	15
Average lowest each month, °F.....	-3	-3	3	21	30	37	46	44	36	24	15	6	-9	15
Extreme highest each month, °F.....	45	43	60	74	82	90	90	90	76	67	52	47	90	30-32
Extreme lowest each month, °F.....	-21	-16	-10	3	25	30	42	41	28	12	3	-17	-21	28-30
Minimum 32° or less, mean number of days.....	30	28	31	23	4	(*)	0	0	1	9	18	27	171	10
<i>Relative humidity</i>														
Average percent.....	87	85	82	78	72	71	73	77	78	82	85	88	80	18-19
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.9	7.0	6.4	5.6	5.4	4.7	5.0	5.5	6.1	7.1	8.1	8.2	6.4	42-43
Less than .2, mean number of days.....	4	4	9	7	7	6	8	6	5	3	2	3	64	10
More than .7, mean number of days.....	22	18	18	17	16	16	14	17	18	23	23	25	227	10
<i>Precipitation</i>														
Average amount (inches).....	1.14	.98	.94	1.06	1.65	1.89	2.09	2.68	2.28	2.13	1.89	1.50	20.15	63-66
Greatest amount (inches).....	2.78	3.74	2.03	2.94	3.54	3.84	4.08	6.55	4.04	4.31	10.64	3.57	31.18	10
Least amount (inches).....	.59	.35	.06	.77	.81	.59	.76	1.99	1.40	1.45	.71	.82	18.61	10
Maximum in 24 hours (inches).....	.83	.94	1.10	1.02	1.77	3.23	3.66	2.09	1.61	1.26	.67	.67	3.66	81-39
Trace or more, mean number of days.....	12	10	10	9	10	9	11	13	13	14	14	13	138	70-71
Mean number of days with snow.....	15	14	12	8	1	(*)	0	0	(*)	0	0	0	51	10
<i>Wind</i>														
Direction (percent of all observations).....														
North.....	7	6	6	8	9	9	9	9	9	8	8	6	8	33-35
Northeast.....	7	9	9	14	14	15	13	10	8	7	7	7	10	33-35
East.....	5	8	9	8	8	7	7	8	6	6	5	5	7	33-35
Southeast.....	13	12	13	10	7	5	6	8	10	12	12	15	10	33-35
South.....	20	19	17	15	9	7	9	15	15	21	23	26	16	33-35
Southwest.....	21	19	18	14	14	13	15	17	19	20	23	21	18	33-35
West.....	14	13	14	14	17	21	17	15	14	11	12	9	14	33-35
Northwest.....	9	10	9	11	15	17	17	15	14	10	9	8	12	33-35
Calm.....	4	4	5	6	7	6	7	6	5	5	3	3	5	33-35
Force 7 or over, mean number of days.....	4	3	2	2	1	1	1	1	2	3	2	3	24	15

*Less than ¼ day.

VYBORG, U.S.S.R.—Lat. 60°45' N., long. 28°45' E., elevation 27 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.88	29.83	29.83	29.91	29.94	29.88	29.83	29.83	29.88	29.97	29.85	29.85	29.88	25
<i>Temperature</i>														
Average, °F.....	17	17	23	36	48	57	63	59	50	40	31	23	39	30
Average highest each month, °F.....	36	37	44	60	73	80	83	80	69	54	46	38	55	30
Average lowest each month, °F.....	-14	-15	-8	13	27	37	81	77	31	19	9	-6	-22	30
Extreme highest each month, °F.....	45	48	56	75	85	91	98	92	79	74	55	44	88	30
Extreme lowest each month, °F.....	-36	-39	-33	-3	20	30	38	33	21	7	-14	-28	-39	30
Minimum 32° or less, mean number of days.....	31	28	30	23	8	(*)	0	0	2	15	24	30	190	10
<i>Relative humidity</i>														
Average percent.....	88	87	80	76	79	69	70	78	83	85	89	89	81	30
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.8	7.5	6.3	6.0	5.6	5.7	5.4	6.3	6.7	7.6	8.6	8.4	6.8	40
Less than .3, mean number of days.....	2	2	4	4	3	2	2	2	1	1	1	1	35	15
More than .7, mean number of days.....	21	17	13	14	11	11	9	13	14	20	24	23	190	15
<i>Precipitation</i>														
Average amount (inches).....	1.28	1.22	1.22	1.34	1.50	2.20	2.44	2.35	2.63	2.44	2.09	1.78	23.43	30
Greatest amount (inches).....	2.7	2.6	2.2	2.9	2.6	6.5	6.3	7.2	6.3	4.6	4.4	4.6	23.3	30
Least amount (inches).....	.2	.2	.2	.2	.3	.5	.1	1.1	.4	.4	.4	.8	.2	30
Maximum in 24 hours (inches).....	.47	.63	.79	.75	.83	1.23	1.34	2.01	1.60	.87	.83	.59	2.01	30
Trace or more, mean number of days.....	18	16	14	13	13	13	14	17	18	19	18	18	190	50
Mean number of days with snow 0.004 inch or more.....	16	15	13	8	1	(*)	0	0	(*)	5	9	17	84	20
<i>Wind</i>														
Direction (percent of all observations)														
North.....	10	11	9	9	9	11	9	10	12	8	9	10	10	30
Northeast.....	7	9	10	12	11	13	11	9	7	8	7	7	9	30
East.....	10	7	11	11	10	10	11	9	7	9	8	11	9	30
Southeast.....	12	12	12	9	6	6	6	9	8	11	15	14	10	30
South.....	13	12	13	12	12	10	11	10	11	13	12	12	12	30
Southwest.....	21	21	23	21	27	25	27	23	20	19	18	17	22	30
West.....	9	6	4	5	5	6	8	8	10	10	12	9	8	30
Northwest.....	7	8	7	6	8	9	5	8	10	8	9	7	8	30
Calm.....	11	14	11	15	12	10	12	14	15	14	10	13	12	30
Force 6 or over, mean number of days.....	6	2	1	3	4	2	3	(*)	3	3	2	1	30	4-5

*Less than 1/2 day.

LENINGRAD, U.S.S.R.—Lat. 59°56' N., long. 30°18' E., elevation 16 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.97	29.94	29.91	29.94	29.97	29.88	29.85	29.85	29.91	29.79	29.94	29.91	29.91	70
<i>Temperature</i>														
Average, °F.....	18	18	25	37	49	58	64	60	51	41	30	22	30	35
Average highest each month, °F.....	36	36	43	61	75	81	83	80	69	57	45	38	35	30
Average lowest each month, °F.....	-9	-7	-1	19	30	40	48	46	35	24	11	-4	-14	35
Extreme highest each month, °F.....	43	43	56	73	86	91	90	90	81	70	54	45	91	55
Extreme lowest each month, °F.....	-33	-30	-25	-7	20	32	43	37	29	9	-8	-36	-36	55
Minimum 32° or less, mean number of days.....	30	28	29	18	4	(*)	0	0	1	8	22	28	100	18
<i>Relative humidity</i>														
Average percent.....	87	85	79	71	64	63	68	74	78	81	86	87	77	27
<i>Cloud cover</i>														
Average amount, scale 0-10.....	8.1	7.5	6.6	6.0	5.9	5.3	5.3	6.1	6.4	7.7	8.3	8.3	6.8	44
Less than 3, mean number of days.....	1	2	4	5	4	4	4	2	3	2	1	1	23	18
More than 7, mean number of days.....	30	17	13	13	11	10	11	11	12	19	20	22	178	18
<i>Precipitation</i>														
Average amount (inches).....	.94	.91	.91	1.02	1.65	2.01	2.48	2.83	2.17	1.77	1.42	1.36	19.23	96
Greatest amount (inches).....	2.64	2.22	2.43	3.37	4.54	5.75	5.35	7.28	7.01	3.19	3.98	2.64	27.33	80
Least amount (inches).....	.16	.13	.08	.31	.43	.31	.30	1.18	.43	.28	.50	.38	15.63	80
Maximum in 24 hours (inches).....	.63	.70	1.14	.94	2.20	2.05	2.30	2.44	1.34	1.10	.79	1.14	2.44	75
Trace or more, mean number of days.....	17	15	13	11	12	12	13	15	14	15	17	18	173	82
Mean number of days with snow 0.004 inch or more.....	20	18	12	7	2	(*)	0	0	(*)	5	13	19	96	18
<i>Wind</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	4	6	5	6	7	10	8	8	9	7	6	4	7	28
Northeast.....	7	8	10	14	15	17	15	10	8	6	5	5	10	28
East.....	7	7	9	11	11	10	10	9	7	8	7	8	8	28
Southeast.....	18	18	19	16	11	9	9	13	13	16	17	21	15	28
South.....	19	17	15	13	9	7	8	12	14	19	18	17	14	28
Southwest.....	15	12	12	10	8	8	11	14	15	17	17	16	13	28
West.....	17	17	16	16	19	20	21	19	17	13	13	13	17	28
Northwest.....	13	14	13	13	19	19	17	15	17	14	17	15	15	28
Calm.....	0	1	1	1	1	0	1	0	1	0	0	1	1	28
Force 7 or over, mean number of days.....	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	28
<i>Visibility (mean number of days)</i>														
0700 L.S.T.:.....														
0-1/4 nautical mile.....	1	3	4	4	1	1	1	2	3	4	3	1	28	6
0-1/2 nautical miles.....	7	14	13	9	5	3	5	6	7	13	9	8	99	6
0-3 nautical miles.....	27	21	23	18	13	9	14	16	16	21	24	26	228	6
1300 L.S.T.:.....														
0-1/4 nautical mile.....	3	3	3	1	1	(*)	(*)	1	1	2	2	2	19	6
0-1/2 nautical miles.....	11	11	9	4	1	2	1	2	4	4	9	11	60	6
0-3 nautical miles.....	25	20	20	10	7	5	7	9	9	15	23	25	174	6
1900 L.S.T.:.....														
0-1/4 nautical mile.....	3	2	4	1	(*)	1	1	1	1	1	1	2	17	6
0-1/2 nautical miles.....	9	8	11	5	1	2	2	2	3	4	7	10	64	6
0-3 nautical miles.....	27	19	26	13	8	7	9	10	15	18	24	26	201	6

*Less than 1/2 day.

HANKO, FINLAND.—Lat. 59°49' N., long. 22°57' E., elevation 20 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.85	29.70	29.85	29.88	29.94	29.88	29.82	29.79	29.91	29.94	29.83	29.82	29.85	25
<i>Temperature</i>														
Average, °F.....	26	23	27	35	46	55	62	60	52	44	36	29	41	50
Average highest each month, °F.	37	37	43	55	65	74	79	74	66	55	46	41	51	59
Average lowest each month, °F.	0	-1	6	19	31	41	50	48	38	26	18	7	-7	20
Extreme highest each month, °F.	42	41	49	60	75	82	86	85	75	61	49	47	56	59
Extreme lowest each month, °F.	-17	-14	-12	9	28	37	45	43	33	20	1	-9	-17	30
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	80	87	84	81	77	75	76	81	83	84	86	83	83	80
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.6	7.3	6.5	6.1	5.4	5.1	5.0	6.0	6.2	7.3	7.8	8.2	6.5	6
Less than .3, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
More than .7, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Precipitation</i>														
Average amount (inches).....	1.77	1.69	1.77	1.46	1.54	1.14	2.28	2.83	2.17	2.28	2.24	2.36	19.57	30
Greatest amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Least amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Maximum in 24 hours (inches).....	.87	.67	1.38	1.34	1.02	1.22	1.42	1.42	.98	2.01	.98	1.54	2.01	30
Trace or more, mean number of days.....	19	16	14	13	14	11	13	16	17	18	17	18	186	30
Mean number of days with snow 0.004 inch or more.....	16	14	11	7	1	(*)	0	0	(*)	3	6	13	71	30
<i>Wind</i>														
Direction (percent of all observations)														
North.....	4	5	6	6	6	6	4	6	9	9	6	7	6	13
Northeast.....	7	7	7	9	8	8	6	6	5	5	8	7	7	13
East.....	5	8	6	8	10	7	10	4	5	3	5	4	6	13
Southeast.....	13	10	7	10	10	7	7	8	8	10	13	14	10	13
South.....	12	7	5	6	4	5	5	6	6	7	9	7	6	13
Southwest.....	20	11	14	11	14	22	18	20	17	19	14	16	16	13
West.....	11	11	15	12	13	17	18	16	16	14	10	13	14	13
Northwest.....	8	9	11	8	9	10	10	11	13	11	9	8	10	13
Calm.....	20	32	29	30	26	21	22	23	21	21	26	24	26	13
Force 7 or over, mean number of days.....	6	4	4	3	2	2	2	2	5	5	6	6	47	20

*Less than 1/2 day.

HELSINKI, FINLAND.—Lat. 60°10' N., long. 24°58' E., elevation 38 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.85	29.82	29.82	29.88	29.91	29.85	29.79	29.79	29.88	29.91	29.82	29.85	29.85	30
<i>Temperature</i>														
Average, °F.....	23	21	26	36	47	56	62	59	51	42	34	26	40	50
Average highest each month, °F.....	37	37	43	56	69	75	81	75	65	54	46	40	52	20
Average lowest each month, °F.....	-4	-4	4	19	30	40	50	46	36	23	15	8	-11	20
Extreme highest each month, °F.....	47	46	53	67	77	85	89	84	74	60	50	47	59	50
Extreme lowest each month, °F.....	-23	-21	-18	7	22	31	42	37	28	14	-6	-18	-23	50
Minimum 32° or less, mean number of days.....	29	27	28	17	8	(*)	0	0	1	8	16	25	153	40
<i>Relative humidity</i>														
Average percent.....	88	87	83	78	74	72	73	80	83	86	88	89	82	30
<i>Cloud cover</i>														
Average amount, scale 0-10.....	8.0	7.4	6.6	6.2	5.6	5.6	5.2	6.0	6.3	7.4	7.9	8.2	6.7	40
Less than 2, mean number of days.....	2	2	5	4	5	5	5	3	3	2	2	2	40	36
More than 8, mean number of days.....	20	16	14	12	9	8	7	10	10	17	20	22	165	36
<i>Precipitation</i>														
Average amount (inches).....	2.17	1.89	1.89	1.54	1.85	1.89	2.48	3.27	2.80	2.72	2.72	2.56	27.76	30
Greatest amount (inches).....	3.5	4.1	5.0	3.5	3.6	4.9	4.8	6.2	5.9	6.2	5.2	5.1	35.3	30
Least amount (inches).....	.5	.2	.5	.1	0	.3	.3	.6	.7	.9	.4	.4	20.7	30
Maximum in 24 hours (inches).....	.98	1.14	.94	.87	1.02	1.38	1.81	1.65	2.13	2.13	1.50	1.54	2.13	30
Trace or more, mean number of days.....	18	15	14	12	12	13	13	16	16	18	18	18	183	50
Mean number of days with snow .004 inch or more.....	17	16	13	7	2	(*)	0	0	(*)	4	10	15	84	36
<i>Wind</i>														
Direction (percent of all observations)														
North.....	10	10	8	9	8	10	8	9	10	9	10	11	9	30
Northeast.....	11	10	11	11	9	8	7	7	10	9	10	12	9	30
East.....	8	12	17	19	16	13	12	10	8	9	6	8	12	30
Southeast.....	7	9	9	9	10	9	8	9	7	8	8	8	8	30
South.....	11	11	10	9	9	9	10	10	10	13	13	14	11	30
Southwest.....	24	20	22	22	26	28	32	28	26	24	22	19	24	30
West.....	14	13	10	8	8	8	10	12	13	13	16	13	12	30
Northwest.....	13	14	11	12	13	14	12	14	18	14	15	14	14	30
Calm.....	2	1	2	1	1	1	1	1	1	0	1	1	1	30
Force 6 or over, mean number of days.....	(*)	(*)	(*)	0	(*)	0	0	0	(*)	(*)	(*)	(*)	(*)	10
<i>Visibility (mean number of days)</i>														
0900 L.S.T.:.....														
0-½ nautical mile.....	4	3	3	3	1	0	(*)	0	(*)	3	3	2	22	8-9
0-2 nautical miles.....	9	6	8	6	2	1	2	1	3	7	7	7	59	8-9
0-5 nautical miles.....	18	13	13	10	5	3	4	4	9	15	17	17	128	8-9
1500 L.S.T.:.....														
0-½ nautical mile.....	2	1	2	1	(*)	0	0	0	(*)	1	1	2	10	8-9
0-2 nautical miles.....	10	5	6	5	1	(*)	(*)	1	2	4	6	7	47	8-9
0-5 nautical miles.....	17	8	10	8	3	1	2	2	6	10	13	16	96	8-9
2000 L.S.T.:.....														
0-½ nautical mile.....	2	2	2	1	(*)	(*)	0	(*)	(*)	1	1	1	10	8-9
0-2 nautical miles.....	10	4	5	6	2	1	1	6	2	3	5	5	50	8-9
0-5 nautical miles.....	17	8	10	9	4	3	2	6	7	9	12	14	101	8-9

*Less than ½ day.

MAARIANHAMINA, FINLAND.—Lat. 60°05' N., long. 19°56' E., elevation 27 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Temperature</i>														
Average, °F.....	28	25	27	36	46	54	62	59	51	43	37	31	42	14
Average highest each month, °F.....	33	30	33	43	54	62	69	66	57	48	40	35	48	14
Average lowest each month, °F.....	24	20	22	30	39	47	55	53	45	39	33	28	36	14
Extreme highest each month, °F.....	44	49	54	69	74	82	85	86	72	65	62	51	86	39
Extreme lowest each month, °F.....	-14	-15	-15	5	21	30	36	34	28	17	-1	-12	-15	39
Minimum 32° or less, mean number of days.....	24	23	25	14	2	(*)	0	0	(*)	4	12	19	122	38
<i>Relative humidity</i>														
Average percent.....	90	88	86	81	75	72	77	81	85	87	86	88	83	20
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.3	7.4	6.5	5.4	5.2	4.5	4.6	5.4	5.6	7.0	7.5	7.9	6.2	25
Less than .2, mean number of days.....	1	2	3	4	6	7	6	4	3	1	1	1	39	14
More than .7, mean number of days.....	18	14	13	11	8	6	7	7	10	15	18	20	147	14
<i>Precipitation</i>														
Average amount (inches).....	1.3	1.2	1.3	1.2	1.5	1.4	2.3	2.9	2.0	2.4	2.2	1.9	21.5	30
Greatest amount (inches).....	2.4	2.7	3.4	2.3	3.2	3.6	7.0	5.0	5.4	4.6	6.2	3.5	28.9	30
Least amount (inches).....	.6	.4	.3	.3	.3	.3	.3	1.1	.9	.7	.8	.7	16.9	30
Maximum in 24 hours (inches).....	.8	.6	1.0	.9	.9	1.1	2.1	2.6	1.1	1.5	.9	.9	2.6	30
Trace or more, mean number of days.....	11	11	11	9	10	9	11	13	12	14	14	14	137	30
Mean number of days with snow.....	9	10	9	4	1	0	0	0	0	2	6	8	49	—
<i>Wind</i>														
Direction (percent of all observations).....														
North.....	2	8	10	10	14	10	10	11	12	7	4	4	8	10
Northeast.....	6	13	10	12	15	8	9	7	8	6	7	9	9	10
East.....	9	13	10	11	10	6	8	7	4	7	9	9	9	10
Southeast.....	12	7	7	14	8	7	9	7	6	9	13	12	9	10
South.....	9	6	7	9	8	11	11	10	8	11	11	11	9	10
Southwest.....	20	16	21	17	22	33	25	23	24	26	25	26	25	10
West.....	15	13	12	4	5	9	8	8	11	12	11	12	10	10
Northwest.....	7	10	11	9	8	10	12	11	12	8	7	5	9	10
Calm.....	11	14	12	14	10	6	8	15	16	14	13	12	12	10
Force 7 or over, mean number of days.....	1	1	(*)	(*)	1	1	1	1	1	1	1	1	10	25

*Less than ½ day.

TURKU, FINLAND.—*Lat. 60°27' N., long. 22°14' E., elevation 52 feet.*

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.79	29.76	29.82	29.85	29.91	29.85	29.79	29.76	29.82	29.88	29.82	29.79	29.82	30
<i>Temperature</i>														
Average, °F.....	23	22	27	37	48	57	63	59	51	42	33	27	41	50
Average highest each month, °F.....	39	38	45	60	72	78	83	77	68	57	47	41	55	20
Average lowest each month, °F.....	-3	-7	1	16	27	36	44	41	33	19	11	-1	-14	20
Extreme highest each month, °F.....	46	48	55	75	83	88	97	89	78	67	52	48	97	50
Extreme lowest each month, °F.....	-29	-23	-22	-4	22	28	36	34	21	6	-8	-19	-29	50
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	90	88	82	79	72	71	72	78	88	86	90	90	82	30
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.6	7.2	6.3	6.1	5.6	5.4	5.2	6.2	6.2	7.4	7.3	8.1	6.6	40
Less than .2, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
More than .7, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Precipitation</i>														
Average amount (inches).....	1.57	1.54	1.61	1.28	1.50	1.72	2.00	2.87	2.26	2.44	2.24	2.17	24.06	30
Greatest amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Least amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Maximum in 24 hours (inches).....	.83	.83	1.20	.71	1.26	1.14	2.01	3.23	1.22	1.69	1.18	1.26	3.23	30
Trace or more, mean number of days.....	15	12	12	11	11	11	12	15	14	16	16	15	161	45
Mean number of days with snow 0.004 inch or more.....	12	11	9	5	1	(*)	0	0	(*)	2	5	9	56	20
<i>Wind</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	5	8	9	8	8	9	7	8	7	8	8	6	8	12
Northeast.....	7	8	7	11	8	6	2	8	6	6	9	10	8	12
East.....	16	15	12	14	13	6	9	7	8	12	15	15	12	12
Southeast.....	15	10	10	12	10	9	10	11	12	10	14	13	11	12
South.....	19	16	16	14	20	20	17	17	14	16	12	15	17	12
Southwest.....	14	10	12	11	13	20	16	16	14	14	14	15	14	12
West.....	6	7	9	8	8	12	12	10	11	11	9	8	9	12
Northwest.....	8	10	11	10	11	11	11	12	12	12	7	8	10	12
Calm.....	10	16	14	12	9	6	10	11	15	11	12	10	11	12
Force 6 or over, mean number of days.....	2	2	2	2	2	2	2	2	2	2	2	2	29	20

*Less than 1/2 day.

VAASA, FINLAND.—Lat. 63°05' N., long. 21°34' E., elevation 30 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Temperature</i>														
Average, °F.....	21	19	24	33	43	53	59	55	49	40	31	23	33	30
Average highest each month, °F.....	27	25	30	41	53	62	70	65	54	43	35	30	45	14
Average lowest each month, °F.....	17	12	16	25	33	43	55	52	44	35	28	21	33	14
Extreme highest each month, °F.....	42	44	47	72	80	82	89	85	67	64	49	42	59	20
Extreme lowest each month, °F.....	-23	-22	-13	10	26	34	42	39	29	15	-2	-25	-25	20
Minimum 32° or less, mean number of days.....	30	28	28	22	6	0	0	0	1	11	21	27	174	—
<i>Relative humidity</i>														
Average percent.....	87	86	80	78	70	71	74	81	83	83	90	89	81	11
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.0	6.4	5.3	6.1	4.6	4.7	4.8	5.6	6.2	7.2	7.5	7.8	6.2	14
Less than .2, mean number of days.....	4	4	6	5	8	8	7	5	4	2	2	2	57	14
More than .7, mean number of days.....	16	11	11	11	6	6	6	8	11	16	17	18	137	14
<i>Precipitation</i>														
Average amount (inches).....	1.7	1.5	1.3	1.4	1.7	2.0	2.4	2.3	2.6	2.3	2.1	1.7	23.5	30
Greatest amount (inches).....	3.4	3.0	2.5	3.1	4.2	3.8	5.4	6.7	5.2	4.0	3.7	3.2	29.6	30
Least amount (inches).....	.5	.2	.4	0	.2	.4	0	.4	.5	.5	.5	.6	16.7	30
Maximum in 24 hours (inches).....	.8	1.3	.5	.7	1.5	1.5	1.3	1.3	1.3	.9	1.3	.9	1.8	30
Trace or more, mean number of days.....	15	13	12	10	11	10	13	17	17	18	16	15	166	30
Mean number of days with snow.....	13	13	11	7	2	(*)	0	0	(*)	4	10	12	72	—
<i>Wind</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	6	8	13	13	15	12	13	12	8	9	5	5	10	10
Northeast.....	7	9	12	17	22	16	13	12	12	7	5	6	12	10
East.....	8	11	8	10	10	7	9	8	7	10	11	12	9	10
Southeast.....	18	9	5	6	5	5	6	6	7	12	14	16	9	10
South.....	15	14	9	9	6	7	8	9	9	12	13	14	11	10
Southwest.....	24	20	19	15	13	17	16	12	19	17	18	18	17	10
West.....	8	9	13	10	11	16	13	12	11	10	7	9	11	10
Northwest.....	4	4	6	7	8	9	8	8	10	8	7	6	7	10
Calm.....	10	16	15	13	10	11	14	19	17	15	15	14	14	10
Force 7 or over, mean number of days.....	1	1	1	(*)	(*)	(*)	(*)	(*)	1	1	1	1	7	—
<i>Visibility (mean number of days)</i>														
0900 L.S.T.:.....														
0-1/4 nautical mile.....	5	4	3	5	2	(*)	(*)	1	3	5	7	5	40	6
0-1/2 nautical miles.....	16	13	10	11	5	5	6	7	11	12	15	20	131	6
0-3/4 nautical miles.....	22	18	15	16	10	10	11	13	15	18	21	26	195	6
1500 L.S.T.:.....														
0-1/4 nautical mile.....	6	2	2	2	(*)	(*)	(*)	(*)	1	4	7	7	31	6
0-1/2 nautical miles.....	14	10	7	8	5	4	4	5	7	13	16	18	111	6
0-3/4 nautical miles.....	20	16	13	13	9	8	10	11	13	17	19	23	167	6
2000 L.S.T.:.....														
0-1/4 nautical mile.....	5	1	2	5	2	(*)	1	(*)	1	3	5	5	30	6
0-1/2 nautical miles.....	16	12	9	11	5	3	5	5	10	13	18	20	131	6
0-3/4 nautical miles.....	20	17	13	17	10	8	10	11	14	22	20	23	184	6

*Less than 1/4 day.

OULU, FINLAND.—*Lat. 65°01' N., long. 25°28' E., elevation 25 feet.*

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.76	29.74	29.82	29.85	29.94	29.85	29.79	29.76	29.79	29.85	29.76	29.79	29.82	30
<i>Temperature</i>														
Average, °F.....	16	14	20	32	43	53	60	55	46	36	26	19	35	50
Average highest each month, °F.....	38	35	40	54	68	77	82	77	66	51	42	37	84	20
Average lowest each month, °F.....	-7	-17	-10	7	24	34	42	37	28	13	0	-10	-23	20
Extreme highest each month, °F.....	41	41	49	75	85	86	90	90	78	63	51	47	90	50
Extreme lowest each month, °F.....	-31	-36	-22	-4	17	31	35	27	21	-1	-19	-27	-36	50
Minimum 32° or less, mean number of days.....	31	28	30	22	9	(*)	0	0	4	15	26	29	193	10
<i>Relative humidity</i>														
Average percent.....	80	87	87	76	68	68	69	76	82	86	90	90	81	30
<i>Cloud cover</i>														
Average amount, scale 0-10.....	7.0	6.2	5.8	5.5	5.5	5.4	5.1	6.1	6.3	7.1	7.2	7.4	6.2	40
Less than .2, mean number of days.....	2	4	5	3	4	4	4	2	1	3	2	2	36	14
More than .7, mean number of days.....	17	12	12	13	10	9	9	12	13	17	19	18	161	14
<i>Precipitation</i>														
Average amount (inches).....	1.37	1.14	1.06	1.18	1.42	1.78	2.48	2.95	2.24	2.09	1.65	1.57	21.10	30
Greatest amount (inches).....	2.9	2.0	2.4	3.6	3.6	4.0	5.2	6.4	5.1	5.4	2.9	3.0	28.3	30
Least amount (inches).....	.8	.4	.3	0	.2	0	.2	.1	.4	.3	.5	.6	14.7	30
Maximum in 24 hours (inches).....	1.10	.87	.75	1.93	.91	2.32	1.30	2.17	1.34	2.05	.87	.71	2.32	30
Trace or more, mean number of days.....	15	12	11	10	11	11	12	14	14	15	14	15	154	50
Mean number of days with snow 0.004 inch or more.....	15	13	12	8	2	(*)	0	0	1	6	11	15	82	20
<i>Wind</i>														
Direction (percent of all observations)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	4	5	6	6	8	10	9	9	10	8	8	5	7	30
Northeast.....	4	6	5	7	9	8	8	9	6	7	5	7	7	30
East.....	9	11	12	12	11	10	8	14	10	11	12	13	11	30
Southeast.....	19	17	18	13	9	6	9	12	13	16	15	19	14	30
South.....	20	18	15	12	8	7	9	10	12	19	20	20	14	30
Southwest.....	10	8	7	6	6	6	7	8	10	9	8	7	8	30
West.....	8	9	11	12	16	17	15	12	13	10	7	6	11	30
Northwest.....	7	7	8	11	19	22	19	12	13	8	8	5	12	30
Calm.....	19	19	18	21	14	14	16	14	13	11	17	18	16	30
Force 6 or over, mean number of days.....	2	2	3	2	2	2	1	1	3	2	2	2	24	20

*Less than 1/2 day.

GÄVLE, SWEDEN.—Lat. 60°41' N., long. 17°10' E., elevation 63 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.91	29.91	29.88	29.94	29.94	29.91	29.83	29.83	29.88	29.85	29.85	29.83	29.88	30
<i>Temperature</i>														
Average, °F.....	24	24	28	37	46	56	61	58	51	41	32	25	40	63
Average highest each month, °F.....	41	42	49	58	73	81	80	77	69	59	48	42	84	45-46
Average lowest each month, °F.....	-5	-8	0	15	25	35	41	37	29	20	7	-1	-11	45-46
Extreme highest each month, °F.....	50	56	59	73	84	92	93	86	82	73	57	49	93	45-46
Extreme lowest each month, °F.....	-27	-25	-20	-8	20	28	34	31	19	-7	-13	-17	-27	45-46
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	88	85	82	77	70	68	72	78	81	85	88	89	80	48
<i>Cloud cover</i>														
Average amount, scale 0-10.....	6.9	6.7	6.2	5.9	5.4	5.3	5.5	5.7	5.7	6.5	6.8	7.6	6.3	46
Less than .2, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
More than .7, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Precipitation</i>														
Average amount (inches).....	.91	.83	.94	1.10	1.61	1.89	2.60	3.23	1.89	2.01	1.50	1.50	20.04	61
Greatest amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Least amount (inches).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Maximum in 24 hours (inches).....	.79	1.65	1.14	1.61	2.17	2.01	2.80	2.68	1.93	1.57	1.43	1.26	2.80	61
Trace or more, mean number of days.....	11	11	12	10	11	11	13	14	12	14	13	14	145	48
Mean number of days with snow 0.004 inch or more.....	10	10	9	5	1	0	0	0	(*)	2	6	11	54	38
<i>Wind†</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	9	13	14	21	22	24	19	16	11	11	10	10	15	41
Northeast.....	5	6	9	10	9	10	10	9	6	7	4	6	8	41
East.....	4	4	6	6	6	6	7	7	6	5	4	6	6	41
Southeast.....	4	5	8	9	11	12	12	12	8	8	5	7	8	41
South.....	14	15	17	17	21	21	21	18	18	16	14	15	17	41
Southwest.....	21	20	14	10	9	8	10	13	18	20	23	20	16	41
West.....	22	17	14	8	5	4	5	7	13	13	21	17	12	41
Northwest.....	16	14	12	11	9	8	10	13	15	16	17	16	13	41
Calm.....	5	6	6	8	8	7	6	5	5	4	2	3	5	41
Force 6 or over, mean number of days.....	2	1	1	1	1	1	1	1	1	2	2	2	16	41

*Less than ½ day.

†Wind observations taken at Stortungfrun Light Tower, lat. 61°10' N., long. 17°20' E.

HÄRNÖSAND, SWEDEN.—*Lat. 62°36' N., long. 17°56' E., elevation 67 feet.*

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.83	29.88	29.85	29.96	29.97	29.93	29.83	29.81	29.91	29.88	29.85	29.84	29.83	30
<i>Temperature</i>														
Average, °F.....	30	30	36	34	45	55	60	57	50	50	30	23	38	26
Average highest each month, °F.....	41	43	46	43	66	74	78	73	65	58	46	41	80	23-34
Average lowest each month, °F.....	-7	-6	-1	14	26	35	48	40	31	20	9	-2	-13	24
Extreme highest each month, °F.....	80	48	57	69	75	89	91	84	73	67	54	46	91	23
Extreme lowest each month, °F.....	-22	-24	-11	0	23	29	37	36	23	3	-7	-22	-24	24
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	63	84	83	74	65	63	70	76	74	82	87	88	77	7
<i>Cloud cover</i>														
Average amount, scale 0-10.....	6.3	6.0	5.9	5.5	5.5	5.0	5.3	5.3	6.1	6.3	6.0	6.9	5.9	30
Less than 3, mean number of days.....	11	7	8	10	12	11	10	7	10	6	6	5	103	3
More than 7, mean number of days.....	10	11	12	9	8	8	4	8	6	13	13	18	114	8
<i>Precipitation</i>														
Average amount (inches).....	1.47	1.15	1.46	.96	1.70	1.67	2.39	3.16	2.70	2.71	2.14	1.73	23.36	50
Greatest amount (inches).....	5.12	3.78	5.25	3.15	4.80	9.02	7.53	8.46	8.25	8.78	8.11	3.82	32.40	51
Least amount (inches).....	0	.12	.32	.08	.30	0	.35	.39	.51	.30	.38	.32	11.10	51
Maximum in 24 hours (inches).....	3.23	.39	1.46	.95	1.37	1.56	3.35	4.67	2.37	1.46	1.15	1.00	4.67	38
Trace or more, mean number of days.....	12	11	12	9	11	10	12	13	11	14	12	15	142	36
Mean number of days with snow 0.004 inch or more.....	11	11	11	6	2	(*)	0	0	(*)	8	7	13	64	36
<i>Wind</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	22	16	12	15	17	16	16	18	12	11	14	16	16	24
Northeast.....	6	7	10	7	11	7	10	13	5	5	5	9	8	24
East.....	2	1	5	3	4	2	2	2	2	1	1	3	2	24
Southeast.....	5	7	6	6	3	4	4	8	5	9	5	9	6	24
South.....	12	20	14	14	15	25	17	12	12	17	19	10	16	24
Southwest.....	8	5	3	4	4	3	3	1	5	6	5	4	4	24
West.....	6	7	4	5	7	6	3	8	9	5	3	2	5	24
Northwest.....	9	8	6	10	9	9	7	9	11	7	6	7	8	24
Calm.....	32	29	34	23	27	27	36	36	39	36	42	40	35	24
Force 6 or over, mean number of days.....	(*)	0	(*)	(*)	0	0	0	(*)	(*)	0	(*)	(*)	(*)	8
<i>Visibility (mean number of days)</i>														
0800 L.S.T.:.....														
0-½ nautical mile.....	2	2	2	2	1	(*)	1	2	2	2	2	1	20	3-0
0-2 nautical miles.....	5	6	6	6	2	1	2	3	5	5	5	5	52	3-0
0-5 nautical miles.....	6	7	7	7	4	2	3	4	5	7	6	7	65	3-0
1400 L.S.T.:.....														
0-½ nautical mile.....	3	1	1	2	1	(*)	1	1	1	1	2	1	15	3-0
0-2 nautical miles.....	7	5	4	5	1	1	2	1	3	4	6	7	46	3-0
0-5 nautical miles.....	8	6	5	6	2	2	2	2	3	5	7	8	56	3-0
1900 L.S.T.:.....														
0-½ nautical mile.....	2	2	1	2	1	1	(*)	(*)	1	1	2	1	14	3-0
0-2 nautical miles.....	6	4	4	4	2	2	1	3	3	4	5	6	42	3-0
0-5 nautical miles.....	7	5	4	6	3	2	2	3	4	5	6	7	53	3-0

*Less than ½ day.

UMEÅ, SWEDEN.—*Lat. 63°49' N., long. 20°17' E., elevation 55 feet.*

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.85	29.88	29.82	29.94	29.94	29.91	29.82	29.82	29.85	29.85	29.82	29.79	29.85	30
<i>Temperatures</i>														
Average, °F.....	17	17	22	32	42	54	59	55	47	37	27	19	36	63
Average highest each month, °F.....	39	40	45	51	67	76	78	72	63	55	44	38	70	39-40
Average lowest each month, °F.....	-15	-13	-8	7	23	32	38	34	27	14	1	-9	-19	39-40
Extreme highest each month, °F.....	45	48	55	61	76	92	88	82	72	66	50	45	92	39-40
Extreme lowest each month, °F.....	-36	-28	-24	-14	16	24	30	27	19	-2	-20	-29	-36	39-40
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	89	87	83	78	67	64	70	76	81	85	88	90	80	48
<i>Cloud cover</i>														
Average amount, scale 0-10.....	6.9	6.7	6.2	5.9	5.9	5.5	5.4	6.1	6.3	6.9	6.8	7.4	6.3	46
Less than .2, mean number of days.....	4	3	5	5	4	6	7	3	5	4	4	2	52	3
More than .7, mean number of days.....	14	16	14	11	12	9	7	14	13	17	16	22	165	8
<i>Precipitation</i>														
Average amount (inches).....	1.61	1.26	1.30	1.10	1.46	1.69	1.85	2.83	2.68	2.36	2.17	1.81	22.13	61
Greatest amount (inches).....	8.50	4.88	4.76	3.82	3.07	5.08	3.98	7.28	9.76	5.94	5.20	3.39	30.00	51
Least amount (inches).....	.35	.12	.12	.16	.08	.12	.16	.28	.67	.39	.24	.20	16.58	51
Maximum in 24 hours (inches).....	2.01	2.09	2.91	1.46	1.73	3.39	2.20	2.95	2.40	1.81	2.17	1.73	3.39	61
Trace or more, mean number of days.....	12	11	10	9	10	9	11	13	13	14	13	14	139	48
Mean number of days with snow 0.004 inch or more.....	11	10	10	7	3	(*)	0	0	(*)	3	8	12	64	38
<i>Wind†</i>														
Direction (percent of all observations).....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
North.....	15	15	13	10	8	9	10	11	12	13	16	17	13	33
Northeast.....	11	16	20	26	28	27	23	24	11	11	8	10	18	33
East.....	4	4	6	5	5	4	5	6	5	5	5	7	5	33
Southeast.....	10	9	8	6	5	6	5	7	6	11	11	14	8	33
South.....	13	15	16	17	16	16	16	16	16	17	15	14	15	33
Southwest.....	20	18	18	18	20	18	20	17	22	19	19	17	19	33
West.....	12	9	7	6	6	6	6	7	12	11	13	10	9	33
Northwest.....	10	8	6	6	6	6	6	8	12	10	11	8	8	33
Calm.....	5	6	6	6	6	8	9	4	4	3	2	3	5	33
Force 6 or over, mean number of days.....	1	1	1	(*)	(*)	(*)	0	(*)	1	1	1	1	7	33

*Less than ½ day.

†Wind observations taken at Holmogadd Light Station.

HAPARANDA, SWEDEN.—Lat. 65°50' N., long. 24°09' E., elevation 30 feet.

Weather elements	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year	Years of record
<i>Sea level pressure</i>														
Average.....	29.77	29.83	29.84	29.95	29.96	29.91	29.81	29.81	29.87	29.86	29.80	29.82	29.85	30
<i>Temperature</i>														
Average, °F.....	11	10	16	28	40	53	58	55	45	34	23	14	32	33
Average highest each month, °F.....	36	36	41	50	64	75	82	75	63	52	39	27	34	23-24
Average lowest each month, °F.....	-20	-20	-13	3	23	36	43	36	27	14	3	-13	-26	24
Extreme highest each month, °F.....	43	43	50	65	79	86	90	85	70	59	44	45	50	23-24
Extreme lowest each month, °F.....	-35	-35	-23	-10	19	29	37	30	21	1	-18	-26	-36	24
Minimum 32° or less, mean number of days.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Relative humidity</i>														
Average percent.....	86	85	83	80	68	67	65	76	81	88	91	87	80	7
<i>Cloud cover</i>														
Average amount, scale 0-10.....	6.6	6.2	5.5	5.4	6.1	5.5	5.7	6.2	6.3	6.8	7.0	7.1	6.2	20
Less than .2, mean number of days.....	4	5	6	5	5	5	7	4	4	4	2	3	5	8
More than .7, mean number of days.....	14	15	13	11	10	10	8	12	15	18	18	20	13	8
<i>Precipitation</i>														
Average amount (inches).....	1.54	1.13	1.05	1.02	1.21	1.46	1.78	2.16	2.33	2.26	2.02	1.44	19.40	71
Greatest amount (inches).....	4.25	4.33	2.64	2.64	2.99	3.66	5.75	5.75	6.97	7.40	4.68	5.18	30.08	71
Least amount (inches).....	0	0	0	.04	0	.04	.04	.04	.24	.20	.47	0	9.21	71
Maximum in 24 hours (inches).....	.73	.69	.69	.84	.80	1.43	1.46	1.72	1.83	1.40	.96	.64	1.83	38
Trace or more, mean number of days.....	15	12	12	9	9	9	12	12	12	14	14	14	144	27
Mean number of days with snow 0.004 inch or more.....	15	12	12	7	3	(*)	0	0	(*)	5	10	13	77	27
<i>Wind</i>														
Direction (percent of all observations)														
North.....	27	25	23	19	21	18	17	18	19	18	19	28	21	24
Northeast.....	9	6	10	9	13	13	16	17	12	9	9	10	11	24
East.....	2	2	4	5	5	3	6	7	5	6	6	7	5	24
Southeast.....	7	9	7	6	4	4	5	4	6	6	7	8	6	24
South.....	16	26	19	25	17	21	15	14	18	15	16	18	18	24
Southwest.....	16	15	18	16	20	21	20	18	19	19	23	17	18	24
West.....	8	6	6	6	5	7	6	6	8	9	8	5	7	24
Northwest.....	9	8	8	8	10	8	6	4	11	11	6	4	8	24
Calm.....	6	3	5	6	5	5	10	10	8	4	7	5	6	24
Force 7 or over, mean number of days.....	0	0	0	(*)	0	0	0	0	0	0	0	0	(*)	7
<i>Visibility (mean number of days)</i>														
0900 L.S.T.:														
0-1/4 nautical mile.....	2	2	2	2	(*)	(*)	0	(*)	1	2	3	2	16	8-9
0-2 nautical miles.....	6	5	5	6	1	1	1	2	2	5	6	4	44	8-9
0-5 nautical miles.....	7	5	7	6	2	3	1	3	4	8	8	5	59	8-9
1800 L.S.T.:														
0-1/4 nautical mile.....	3	2	2	2	1	(*)	(*)	(*)	1	2	3	1	17	8-9
0-2 nautical miles.....	7	6	4	4	1	1	1	1	2	6	7	3	43	8-9
0-5 nautical miles.....	8	6	4	5	2	2	1	1	4	8	8	5	54	8-9
2000 L.S.T.:														
0-1/4 nautical mile.....	3	3	2	2	(*)	(*)	0	0	0	3	2	2	17	3
0-2 nautical miles.....	6	6	5	5	1	1	1	1	2	5	6	5	44	3
0-5 nautical miles.....	6	6	6	6	2	2	2	2	4	7	8	6	57	3

*Less than 1/4 day.

GLOSSARIES

Words found occasionally on charts and in Sailing Directions

ESTONIAN

Estonian	English	Estonian	English
äär.....	Shore, coast.	Merehein, adru.....	Seaweed.
Abajas.....	Gulf bay.	Merekael.....	Sound, strait.
Adru.....	Seaweed.	Merelaht.....	Gulf, bay.
Alumine.....	Lower, front.	Meremärk.....	Seamark.
Ankrupagaid.....	Anchorage.	Meri.....	Sea.
Asundas.....	Settlement.	Muul.....	Mole.
		Muda.....	Mud
Baak.....	Beacon.	Munakivid.....	Boulders, shingle.
		Must.....	Black.
Edel.....	Southwest.	Nem, neem, nemi,	
Ehitus.....	Building.	nina, ninna.....	Point.
Faarvater.....	Channel.	Nord.....	North.
		Ost.....	East.
Haabjas.....	Boat.	Ots.....	Point.
Haige-maja, hospital.....	Hospital.		
Hall.....	Gray.	Paak.....	Beacon.
Hoone.....	House.	Paare.....	Bar.
		Päästejaam.....	Life-saving station.
Ida.....	East.	Paat.....	Boat.
Jää.....	Ice.	Pais.....	Dam.
Jaam.....	Station.	Pattarel.....	Battery.
Jarv.....	Lake.	Pealvett.....	Underwater.
Jõesuu.....	River mouth.	Peastepaat.....	Life boat.
Jõgi.....	River.	Peen.....	Fine.
Joom.....	Dune, reef, sand bank.	Pehme.....	Soft.
Juum.....	Sand bank.	Põhi.....	North.
		Põhjaida.....	Northeast.
Kabel.....	Chapel.	Põhjäläine.....	Northwest.
Kaevand.....	Canal, channel.	Poi.....	Buoy.
Kagu.....	Southeast.	Poolsaar.....	Peninsula.
Kalasadam.....	Fishing harbor.	Pruum, tõmmu.....	Brown.
Kalde.....	Shore, bluff.	Punane.....	Red.
Kalju.....	Rock.	Puu.....	Trees, woods.
Kallak, Kallas.....	Shore, bluff.		
Kants, kindlus.....	Fort.	Raba.....	Marsh.
Kapp.....	Cape.	Rahu.....	Island, rock.
Kari.....	Rock, reef, shoal.	Rand.....	Coast, shore.
Kink.....	Hill.	Reid.....	Roadstead.
Kird.....	Northeast.	Riff.....	Reef.
Kirik.....	Church.	Roheline.....	Green.
Kitsus.....	Narrows.	Rüngas.....	Cliff.
Kivi.....	Rock, stone.		
Kollane.....	Yellow.	Saar.....	Island.
Kõnetraat.....	Telephone.	Sadam.....	Harbor.
Kõrge, kõrgustik.....	Height, elevation.	Salm.....	Small strait.
Korsten.....	Chimney.	Savi.....	Clay.
Kruus.....	Gravel.	Sihtpagid.....	Range beacon.
Küla.....	Village.	Silm.....	Narrow channel.
Kungas.....	Hill.	Sinine.....	Blue.
Kurk.....	Sound, strait.	Sissesõit.....	Entrance.
		Sõmer.....	Coarse sand.
Lääs, lääne.....	West, westerly.	Suu.....	Mouth.
Laev.....	Vessel.	Süüd.....	South.
Laevasild.....	Pier.		
Laht, lahti.....	Gulf, bay.	Toll.....	Customs.
Lainetemurd.....	Breakers.	Tonn.....	Buoy.
Läiv.....	Sand.	Torn.....	Tower.
Linn.....	Town, city.	Tuleboi.....	Light buoy.
Loe, loode.....	Northwest.	Tulelaev.....	Light vessel.
Loots.....	Pilot.	Tulepaak.....	Light beacon.
Lootsjaam.....	Pilot station.	Tuletorn.....	Light tower.
Loes.....	Castle.	Tuli.....	Light.
Lõuna.....	South, noon.	Tuule-veski.....	Windmill.
Lõunaida.....	Southeast.		
Lõunalääne.....	Southwest.	Udu.....	Fog.
Lumi.....	Snow.	Ülemine.....	Upper, rear.
Maa.....	Land.	Vain.....	Sound, strait.
Maabumis sild.....	Landing stage.	Valge.....	White.
Maamärgid.....	Landmarks.	Värv.....	Entrance.
Maanina.....	Point.	Varemed.....	Ruins.
Madalik.....	Shoal.	Veski.....	Mill.
Mäeahelik.....	Mountain range.	Vile boi.....	Whistle buoy.
Mägi.....	Mountain, hill.	Voolus.....	Current.
Maja.....	House.	Vrakk.....	Wreck.
Märkpu.....	Conspicuous tree.		

RUSSIAN

English	Russian transliteration	Russian print
Above water.....	Nadvodn-y, -aya, -oye.....	Надводн-ий, -ая, -ое, -ие
Anchorage.....	Yakornoye mesto.....	Якорное место
Bank, stony.....	Pakhtha.....	Пакhta
Bar.....	Bar.....	Бар
Bay.....	Perebor, perekat.....	Перебор, Перекат
Bay.....	Bukhtáchka.....	Бухточка
Bay.....	Kultuk.....	Култух
Bay.....	Bukhta.....	Бухта
Bay.....	Zavod.....	Завод
Bay.....	Zaliv.....	Залив
Bay.....	Guba.....	Губа
Beach.....	Priberezh'ye.....	Прибережье
Black.....	Chern-y, -aya, -oye.....	Черн-ий, -ая, -ое
Blue.....	Siniy.....	Синий
Bluff.....	Obryv.....	Обрыв
Breakers.....	Burun.....	Бурун
Canal.....	Kollektor.....	Коллектор
Canal, channel, dredged channel.....	Kanal.....	Канал
Cape.....	Mis, mys.....	Мыс, Мыс
Cape.....	Roshok.....	Рожок
Cape.....	Nos.....	Нос
Cape.....	Navolok, nos.....	Наволоч, Нос
Cape.....	Zvelav'ye.....	Звелавье
Channel.....	Fartwater.....	Фартватер
Channel.....	Garlo.....	Гарло
Channel.....	Ust'ye.....	Устье
Church.....	Tserkov.....	Церковь
Cliff.....	Utes.....	Утес
Cliffs.....	Yary.....	Яры
Coast.....	Poberezh'ye.....	Побережье
Coast.....	Pomor'ye.....	Поморье
Cove.....	Bukhtochka.....	Бухточка
Cove.....	Kovsh.....	Ковш
Current.....	Techenie.....	Течение
Dark (color).....	Temni.....	Темный
Deep.....	Glubok-y, -aya, -oye.....	Глубок-ий, -ая, -ое
Dry land.....	Suzem.....	Сузем
Drying shoals.....	Koshka.....	Копка
Eastern.....	Vostochn-y, -aya, -oye.....	Восточн-ий, -ая, -ое
Entrance.....	Vkhod.....	Вход
Estuary.....	Liman.....	Лиман
First.....	Perv-y, -aya, -oye.....	Перв-ий, -ая, -ое
Fishing harbor.....	Kalasadam.....	Каласадам
Flat extending from shore.....	Otmel.....	Отмель
Front.....	Peredn-y, -aya, -oye.....	Передн-ий, -ая, -ое
Gates, entrances, passage.....	Vorota.....	Ворота
Gray.....	Seri.....	Серый
Great large, big.....	Bol'sh-oy, -aya, -oye.....	Больш-ой, -ая, -ое
Green.....	Zelen-y, -aya, -oye.....	Зелен-ий, -ая, -ое
Gullet, passage.....	Prokhod.....	Проход
Harbor.....	Gavan'.....	Гавань
Head (of pier, etc.).....	Golova.....	Голова
Higher.....	Vyssh-y, -aya, -oye.....	Высш-ий, -ая, -ое
Hill, mountain.....	Gora.....	Гора
Hill, mountain.....	Kholm.....	Холм
Hill, mountain, elevation.....	Vozyshenie.....	Возвышение
Ice.....	Led.....	Лед
Inner.....	Vnutrenni.....	Внутренний
Island.....	Berezhn-y, -aya, -oye.....	Бережн-ий, -ая, -ое
Isthmus.....	Ostrov.....	Остров
Isthmus.....	Pereshyeyek.....	Перешеек
Lake.....	Ozero.....	Озеро
Land.....	Zemlya.....	Земля
Landing stage pier, small port.....	Pristan'.....	Пристань
Lighthouse.....	Mayak.....	Маяк
Little, small.....	Mal-y, -aya, -oye.....	Мал-ий, -ая, -ое
Little, small.....	Malen'k-y, -aya, -oye.....	Маленьк-ий, -ая, -ое
Long.....	Dlinn-y, -aya, -oye.....	Длинн-ий, -ая, -ое
Long sandy drying shoal.....	Zastruga.....	Заструга
Lower.....	Nizhn-y, -aya, -oye.....	Нижн-ий, -ая, -ое
Mainland, continent.....	Materik.....	Материк
Mark, sign, beacon.....	Znak.....	Знак
Middle.....	Sredn-y, -aya, -oye.....	Средн-ий, -ая, -ое
Mill.....	Mel, Mel'n, Mel'nista.....	Мел, Мельн, Мельница
Mill.....	Zavod.....	Завод
Mountain.....	Golets.....	Голец
Mountain.....	Khrebet.....	Хребет
Mud.....	Il.....	Ил
Mud.....	Plavnya.....	Плавня
Muddy.....	Ilist-y, -aya, -oye.....	Илист-ий, -ая, -ое

RUSSIAN

English	Russian transliteration	Russian print
New.....	Nov-y, -aya, -oye.....	Нов-ый, -ая, -ое
Northern.....	Severn-y, -aya, -oye.....	Северн-ый, -ая, -ое
Old.....	Star-y, -aya, -oye.....	Стар-ый, -ая, -ое
Open.....	Tina.....	Тина
Open sea.....	Golomyann-y, -aya, -oye.....	Голомянн-ый, -ая, -ое
Outer.....	Vnyeshn-y, -aya, -oye.....	Внешн-ый, -ая, -ое
Peak.....	Pik.....	Пик
Peninsula.....	Poluostrov.....	Полуостров
Pier, landing stage.....	Bryuaga.....	Брюага
Pilot station.....	Lotsmanskaya.....	Лотеманская
Plain.....	Ravnina.....	Равнина
Port, harbor.....	Satama.....	Сатама
.....,	Port.....	Порт
Reach.....	Koleno.....	Колено
Rear.....	Zadn-i, -aya, -oye.....	Задн-ий, -ая, -ое
Red.....	Krasn-y, -aya, -oye.....	Красн-ый, -ая, -ое
Reef.....	Rif.....	Риф
....., rock.....	Stamik.....	Стамик
Ridge.....	Greben.....	Гребень
....., mountain.....	Kryazh.....	Кряж
River.....	Iygi.....	Иги
.....,	Reka.....	Река
.....,	Ryeka.....	Река
Road.....	Doroga.....	Дорога
Roadstead.....	Reyd.....	Рейд
Rock above water.....	Baklysh.....	Баклыш
....., or reef above water.....	Lud-a, -ka.....	Луд-а, -ка
....., cliff.....	Skala.....	Скала
....., stone.....	Kamen'.....	Камень
Rock.....	Kamni.....	Камни
Rocky bank, dry.....	Kamyennaya banka.....	Каменная банка
....., shoal.....	Korga.....	Корга
Salt marsh.....	Solonchak.....	Солончак
Sand bank.....	Pesok.....	Песок
Sandbank.....	Rossyp.....	Россып
....., bar.....	Perebor, perekat.....	Перебор, Перекат
Sandspit.....	Strelka.....	Стрелка
Sandy.....	Peschan-y, -aya, -oye.....	Песчан-ый, -ая, -ое
.....,	Pesochn-y, -aya, -oye.....	Песочн-ый, -ая, -ое
Sea.....	More.....	Море
Second.....	Vtor-oy, -aya, -oye.....	Втор-ой, -ая, -ое
Shallow water.....	Melkovodn-y, -aya, -oye.....	Мелководн-ый, -ая, -ое
.....,	Melki-y, -aya, -oye.....	Мелк-ий, -ая, -ое
Shelf, ledge.....	Gryada.....	Гряды
Shoal.....	Banka.....	Банка
.....,	Mel'.....	Мель
.....,	Myel'.....	Мель
....., patch.....	Pyatno.....	Пятно
Shore, river bank.....	Bereg.....	Берег
Short.....	Korotk-y, -aya, -oye.....	Коротк-ий, -ая, -ое
Skerries.....	Shkhery.....	Шхеры
Southern.....	Yuzhn-y, -aya, -oye.....	Южн-ый, -ая, -ое
Spit.....	Kosa.....	Коса
.....,	Kamyennaya eryada.....	Каменная гряда
Station, camp, settlement.....	Stanovishche.....	Становище
Steep banks.....	Krutoyar.....	Крутой
Strait.....	Gorlo.....	Горло
.....,	Proliv.....	Пролив
.....,	Salma.....	Салма
.....,	Shar.....	Шар
Tableland.....	Ploskogor'ye.....	Плоскогорье
Tower.....	Bashnya.....	Башня
Town, city.....	Gorod.....	Город
....., small.....	Gorodok.....	Городок
Upper.....	Vyerkhn-y, -aya, -oye.....	Верхн-ый, -ая, -ое
Valley.....	Dolina.....	Долина
Village.....	De-evnya.....	Деревня
....., hamlet.....	Poselok.....	Поселок
....., with church.....	Selo.....	Село
Western.....	Zapadn-y, -aya, -oye.....	Западн-ый, -ая, -ое
White.....	Bel-y, -aya, -oye.....	Бел-ый, -ая, -ое
Wooded.....	Lesnoy.....	Лесной
Yellow.....	Zhelt-y, -aya, -oye.....	Желт-ый, -ая, -ое

FINNISH

Finnish	English	Finnish	English
Alempi.....	Lower.	Metsä.....	Forest.
Ankkuripaikka.....	Roadstead.	Musta.....	Black.
Ankkuripohja.....	Anchorage.	Muta.....	Mud.
Aukko.....	Strait.	Niemeke.....	Point (of land).
Etelä.....	South.	Niemi.....	Peninsula, point, cape.
Eteläinen.....	Southern.	Pohja.....	North.
Hieta.....	Sand.	Pohjoinen.....	Northern.
Iso.....	Great, large.	Poiju.....	Buoy.
Itä.....	East.	Punainen.....	Red.
Itäinen.....	Eastern.	Purjehdusmerkki.....	Beacon.
Jää.....	Ice.	Puro.....	Brook, rivulet.
Järvi.....	Lake.	Rannikko.....	Coast.
Joki.....	River.	Ranta.....	Shore, beach.
Jyrkkä.....	Bluff.	Reimari.....	Spar buoy.
Kanaali.....	Channel.	Reitti.....	Strait.
Kannas.....	Isthmus.	Reivi.....	Reef.
Kanava.....	Channel.	Riutta.....	Reef.
Karl.....	Reef, shoal, island.	Saari.....	Island.
Kaupunki.....	City, town.	Salmi.....	Strait.
Keltainen.....	Yellow.	Satama.....	Harbor.
Kirkko.....	Church.	Savi.....	Clay.
Kivi.....	Rock.	Selkä.....	Body of water.
Kivia.....	Stones.	Silta.....	Bridge, pier.
Kumpeli.....	Beacon.	Sininen.....	Blue.
Kylä.....	Village.	Sisämainen.....	Inner.
Kynnys.....	Bar.	Sora.....	Gravel.
Lahti.....	Bay, gulf.	Suu.....	Mouth.
Laituri.....	Pier, quay.	Taiple.....	Isthmus.
Länsi.....	West.	Talo.....	House.
Läntinen.....	Western.	Torni.....	Tower, steeple.
Lieju.....	Mud.	Tulli.....	Customs.
Linnotus.....	Fort.	Tumma.....	Dark.
Loisto.....	Light.	Ulkonainen.....	Outer.
Luoto.....	Rocky islet.	Vaalea.....	Light (color).
Majakka.....	Lighthouse.	Vaara.....	Hill, mountain.
Mäki.....	Hill, mountain.	Vähä.....	Little.
Matala.....	Shallow, shoal bank.	Valkoinen.....	White.
Matalikko.....	Bank, shoal.	Väylä.....	Channel, fairway.
Meri.....	Sea, ocean.	Viheriä.....	Green.
Merimerkki.....	Beacon.	Viitta.....	Spar buoy.
Merkki.....	Mark.	Vuori.....	Mountain.
		Ylempi.....	Upper.

SWEDISH

Swedish	English	Swedish	English
Ä, älv, älven.....	Stream, rivulet, river.	Landtunga.....	Spit of land, neck of land.
Ankarplats.....	Anchorage.	Lastageplats.....	Loading place.
Ankarsättning.....	Roadstead, anchorage.	Led.....	Channel.
Äs.....	Ridge.	Lill, lilla.....	Little
Bäck.....	Brook.	Lots.....	Pilot.
Backe.....	Hill.	Lopp.....	Channel, passage.
Båk.....	Beacon.	Lund.....	Grove.
Bank.....	Bank (shoal).	Märke.....	Mark.
Berg, berget.....	Mountain, hill.	Möl.....	Mill.
Bergspets.....	Peak, summit.	Mudder, slam, dy.....	Mud.
Boj.....	Buoy.	Mun, mynning.....	Mouth, outlet.
Borg.....	Castle, fort.	Näs.....	Cape, promontory.
Brant.....	Steep, precipitous.	Norr, norra.....	North, northern.
Bränning.....	Breakers, surf.	Ö, ön.....	Island.
Bredning.....	Wide place in a river or channel.	Öster, östra, östre.....	East, eastern.
Bro, brygga.....	Bridge, landing place.	Räddningsstation.....	Life-saving station.
Bukt, bukten.....	Bight, bay.	Ränna.....	Channel.
By.....	Town.	Redd.....	Roadstead.
Dal.....	Valley.	Rev.....	Reef.
Dy.....	Mud.	Röd.....	Red.
Ebb.....	Ebb tide.	Rös, röse.....	Heap of stones.
Färja.....	Ferry.	Sand.....	Sand.
Farvatten, farled.....	Fairway.	Sjö.....	Sea, lake.
Fästning.....	Fortress.	Sjömärke.....	Seamark.
Fjäll.....	Mountain, hill.	Skans.....	Fort.
Fjärd, fjarden.....	An arm of the sea.	Skär.....	Rock (above water).
Flod.....	River, high water.	Skärgård.....	Fringing rocks, islets, shoals.
Fyr.....	Light.	Skog.....	Wood or forest.
Fyrskepp.....	Light vessel.	Slick.....	Ooze.
Fyrtorn.....	Light tower.	Slott.....	Castle.
Gap.....	Opening, inlet, passage.	Söder.....	South.
Grund, grundet.....	Shoal.	Södra.....	Southern.
Hake.....	Hook (of land).	Spets.....	Point.
Hals.....	Neck (of land).	Stad.....	Town, city.
Halvö, halvön.....	Peninsula.	Stång.....	Pole, spar.
Hamn.....	Harbor.	Stene.....	Stone or rock.
Hav.....	Sea.	Stor, stora.....	Great, large.
Höjd, hög.....	Height, hill.	Strand.....	Beach, shore.
Holm, holme, holmen.....	Islet.	Ström.....	Current, tidal current.
Hufvud.....	Head.	Sund, sundet.....	Sound.
Inlopp.....	Entrance.	Svart.....	Black.
Inre.....	Inner.	Syd, södra.....	South, southern.
Insjö.....	Lake.	Torn.....	Tower.
Is.....	Ice.	Udde, udden.....	Point.
Kaj.....	Quay, wharf.	Vägbrytare.....	Breakwater.
Kap.....	Cape.	Vall.....	Steep coast.
Klint.....	Cliff (summit of).	Vest, vestre, västra.....	West, western.
Klippa.....	Cliff or rock.	Vik, viken.....	Creek, bay, cove.
Kulle.....	Hill.	Vitt.....	White.
Kust.....	Coast.	Ytterst.....	Outermost.
Kyrka.....	Church.	Yttre.....	Outer.

STYLES AND VARIETIES OF MODERN RUSSIAN LETTERING

A	А а	А а	А а	А а
B	Б б	Б б б	Б Б б б	Б б
V	В в	В в в	В В в в	В в
G	Г г	Г г	Г Г г г	Г г
D	Д д	Д д д	Д Д д д	Д Д д
E, YE	Е е	Е е	Е е	Е е
Ё	Ё ё	Ё ё	Ё ё	Ё ё
ZH	Ж ж	Ж Ж ж	Ж Ж ж ж	Ж ж
Z	З з	З з	З з з	З з
I	И и	И И и	И И и	И И и
Y	Й й	Й Й й	Й й	Й Й й
K	К к	К к	К К к к	К К к к
L	Л л	Л л	Л Л л л	Л л
M	М м	М М м	М М м	М м
N	Н н	Н н	Н Н н	Н н
O	О о	О о	О о	О о
P	П п	П П п	П П п	П п
R	Р р	Р р	Р Р р р	Р р
S	С с	С с	С с	С с
T	Т т	Т Т т т	Т Т т т	Т т
U	У у	У у	У у у	У у
F	Ф ф	Ф ф	Ф Ф ф	Ф ф
KH	Х х	Х х	Х х	Х х
TS	Ц ц	Ц Ц ц	Ц Ц ц ц	Ц ц
CH	Ч ч	Ч ч	Ч ч	Ч ч
SH	Ш ш	Ш Ш ш	Ш ш	Ш ш
SHCH	Щ щ	Щ Щ щ	Щ щ	Щ щ
"	Ъ ъ	Ъ ъ	Ъ ъ	Ъ ъ
Y	Ы ы	Ы ы	Ы ы	Ы ы
'	Ь ь	Ь ь	Ь ь	Ь ь
E	Ѣ ѣ	Ѣ ѣ ѣ ѣ	Ѣ ѣ ѣ	Ѣ ѣ ѣ
E	Э э	Э э	Э э	Э э
YU	Ю ю	Ю ю	Ю ю	Ю ю
YA	Я я	Я я	Я я	Я я

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CONVERSION TABLES

FEET TO METERS

Feet	0	1	2	3	4	5	6	7	8	9
0	0.00	0.30	0.61	0.91	1.22	1.52	1.83	2.13	2.44	2.74
10	3.05	3.35	3.66	3.96	4.27	4.57	4.88	5.18	5.49	5.79
20	6.10	6.40	6.71	7.01	7.32	7.62	7.92	8.23	8.53	8.84
30	9.14	9.45	9.75	10.06	10.36	10.67	10.97	11.28	11.58	11.89
40	12.19	12.50	12.80	13.11	13.41	13.72	14.02	14.33	14.63	14.93
50	15.24	15.54	15.85	16.15	16.46	16.76	17.07	17.37	17.68	17.98
60	18.29	18.59	18.90	19.20	19.51	19.81	20.12	20.42	20.73	21.03
70	21.34	21.64	21.95	22.25	22.55	22.86	23.16	23.47	23.77	24.08
80	24.38	24.69	24.99	25.30	25.60	25.91	26.21	26.52	26.82	27.13
90	27.43	27.74	28.04	28.35	28.65	28.96	29.26	29.57	29.87	30.17

FATHOMS TO METERS

Fathoms	0	1	2	3	4	5	6	7	8	9
0	0.00	1.83	3.66	5.49	7.32	9.14	10.97	12.80	14.63	16.46
10	18.29	20.12	21.95	23.77	25.60	27.43	29.26	31.09	32.92	34.75
20	36.58	38.40	40.23	42.06	43.89	45.72	47.55	49.38	51.21	53.03
30	54.86	56.69	58.52	60.35	62.18	64.01	65.84	67.67	69.49	71.32
40	73.15	74.98	76.81	78.64	80.47	82.30	84.12	85.95	87.78	89.61
50	91.44	93.27	95.10	96.93	98.75	100.58	102.41	104.24	106.07	107.90
60	109.73	111.56	113.39	115.21	117.04	118.87	120.70	122.53	124.36	126.19
70	128.02	129.85	131.67	133.50	135.33	137.16	138.99	140.82	142.65	144.47
80	146.30	148.13	149.96	151.79	153.62	155.45	157.28	159.11	160.93	162.76
90	164.59	166.42	168.25	170.08	171.91	173.74	175.56	177.39	179.22	181.05

METERS TO FEET

Meters	0	1	2	3	4	5	6	7	8	9
0	0.00	3.28	6.56	9.84	13.12	16.40	19.68	22.97	26.25	29.53
10	32.81	36.09	39.37	42.65	45.93	49.21	52.49	55.77	59.06	62.34
20	65.62	68.90	72.18	75.46	78.74	82.02	85.30	88.58	91.86	95.14
30	98.42	101.71	104.99	108.27	111.55	114.83	118.11	121.39	124.67	127.95
40	131.23	134.51	137.80	141.08	144.36	147.64	150.92	154.20	157.48	160.76
50	164.04	167.32	170.60	173.88	177.16	180.45	183.73	187.01	190.29	193.57
60	196.85	200.13	203.41	206.69	209.97	213.25	216.54	219.82	223.10	226.38
70	229.66	232.94	236.22	239.50	242.78	246.06	249.34	252.62	255.90	259.19
80	262.47	265.75	269.03	272.31	275.59	278.87	282.15	285.43	288.71	291.99
90	295.28	298.56	301.84	305.12	308.40	311.68	314.96	318.24	321.52	324.80

METERS TO FATHOMS

Meters	0	1	2	3	4	5	6	7	8	9
0	0.00	0.55	1.09	1.64	2.19	2.73	3.28	3.83	4.37	4.92
10	5.47	6.01	6.56	7.11	7.66	8.20	8.75	9.30	9.84	10.39
20	10.94	11.48	12.03	12.58	13.12	13.67	14.22	14.76	15.31	15.86
30	16.40	16.95	17.50	18.04	18.59	19.14	19.68	20.23	20.78	21.33
40	21.87	22.42	22.97	23.51	24.06	24.61	25.15	25.70	26.25	26.79
50	27.34	27.89	28.43	28.98	29.53	30.07	30.62	31.17	31.71	32.26
60	32.81	33.36	33.90	34.45	35.00	35.54	36.09	36.64	37.18	37.73
70	38.28	38.82	39.37	39.92	40.46	41.01	41.56	42.10	42.65	43.20
80	43.74	44.29	44.84	45.38	45.93	46.48	47.03	47.57	48.12	48.67
90	49.21	49.76	50.31	50.85	51.40	51.95	52.49	53.04	53.59	54.13

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Mariners are requested to cooperate in the corrective maintenance of navigational publications by reporting all discrepancies between published information and conditions actually observed or encountered and by recommending appropriate additions, deletions, or improvements.

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REPORT URGENT DANGERS BY RADIO

U.S. NAVAL OCEANOGRAPHIC OFFICE SAILING DIRECTIONS

New No.	Old No.	Ed.-Date	
			AREA 1—CANADA, GREENLAND, AND ICELAND
10	175	6-1960	BRITISH COLUMBIA, VOL. I, Strait of Juan de Fuca and Inner Pass- ages to meape Caution.
11	176	6-1962	BRITISH COLUMBIA, VOL. II, Cape Caution to Alaska.
12	99	9-1952	NOVA SCOTIA, The Bay of Fundy and Cape Breton Island.
13	100	7-1951	THE GULF AND RIVER ST. LAWRENCE, Western shores of the gulf and the river and seaway to Cornwall Island.
14	73	8-1958	NEWFOUNDLAND, Includes Strait of Belle Isle and St. Pierre and Miquelon Islands.
15	77	1-1965	LABRADOR AND HUDSON BAY, Labrador northward of St. Lewis Sound, Hudson Strait and Hudson Bay.
16	76	2-1951	BAFFIN BAY AND DAVIS STRAIT, Includes northern Greenland east- ward to Cape Morris Jesup.
17	75	2-1951	EAST GREENLAND AND ICELAND, Includes the island of Jan Mayen.
			AREA 2—LATIN AMERICA AND ANTARCTICA
20	130	5-1952	EAST COASTS OF CENTRAL AMERICA AND MEXICO, Includes north coast of Columbia.
21	128	3-1958	THE WEST INDIES, VOL. I, Bermuda, Bahamas, and Greater Antilles.
22	129	7-1963	THE WEST INDIES, VOL. II, Lesser Antilles and Venezuela.
23	172	5-1952	SOUTH AMERICA, VOL. I, East coast from Venezuelan border to and including Rio de la Plata.
24	173	5-1952	SOUTH AMERICA, VOL. II, East and west coasts between Rio de la Plata and Cabo Tres Montes, including Falkland, South Georgia, and South Sandwich Islands.
25	174	6-1960	SOUTH AMERICA, VOL. III, West coast between Gulf of Panama and Cabo Tres Montes.
26	84	9-1951	WEST COASTS OF MEXICO AND CENTRAL AMERICA, The United States border to Columbian border.
27	138	2-1960	ANTARCTICA, Includes islands south of latitude 60°.
			AREA 3—BRITISH ISLES AND NORTHWESTERN EUROPE
30	146	5-1962	IRELAND.
31	144	4-1952	SOUTH COAST OF ENGLAND, Scilly Isles to North Foreland.
32	145	4-1951	WEST COASTS OF ENGLAND AND WALES, Lands End to Mull of Gal- loway, including Isle of Man.
33	147	4-1951	WEST COAST OF SCOTLAND, Mull of Galloway to Cape Wrath, in- cluding the Hebrides.
34	149	3-1950	NORTH AND EAST COASTS OF SCOTLAND, Cape Wrath of Fife Ness, including Orkney, Shetland, and Faeroe Islands.
35	150	5-1951	EAST COAST OF ENGLAND, Fife Ness to North Foreland, including the Firth of Forth.
36	135	5-1959	EASTERN SHORES OF THE NORTH SEA, Dunkerque to Skagen.
37	132	4-1951	NORTH COAST OF FRANCE, Northwestern end of France to Belgium.
38	133	5-1951	BAY OF BISCAY, West coast of France and north coast of Spain.
			AREA 4—BALTIC, SCANDINAVIA, AND NORTHERN U.S.S.R.
40	140	1-1955	NORTHERN AND EASTERN SHORES OF THE SKAGERRAK, Lindesnes to Marstrandsfjorden.
41	141A	1-1956	KATTEGAT AND THE SOUND, Skagen to Falsterbo, including Fakse Bugt.
42	141B	1-1958	THE BALTIC, VOL. I, Store Baelt, Lille Baelt, and coast from Den- mark to Kap Arkona.
43	142	4-1951	THE BALTIC, VOL. II, Baltic Sea from Falsterbo Udde and Kap Arkona to the Gulfs of Finland and Bothnia.

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New No.	Old No.	Ed.-Date	
44	143	3-1952	THE BALTIC, VOL. III, Gulfs of Finland and Bothnia.
45	139	1-1955	SOUTHWEST COAST OF NORWAY. Lindesnes to Fedje.
46	136	4-1952	NORTHWEST AND NORTH COASTS OF NORWAY. Fedjeosen to Nye-myetski Point, U.S.S.R., including Svalbard Archipelago.
47	137A	1-1953	NORTHERN U.S.S.R., VOL. I, Mys Nemetskiy to Mys Kanai Nos.
48	137B	1-1954	NORTHERN U.S.S.R., VOL. II, Mys Kanin Nos to Ostrov Dikson.
49	137C	1-1954	NORTHERN U.S.S.R., VOL. III, Ostrov Dikson to Mys Shmidt.
AREA 5—MEDITERRANEAN AND WESTERN AFRICA			
50	105	4-1951	SOUTHWEST COAST OF AFRICA. Cape Palmas to Cape of Good Hope.
51	134	6-1952	WEST COASTS OF SPAIN, PORTUGAL, AND NORTHWEST AFRICA AND OFF-LYING ISLANDS. Includes Azores, Madeira, Canary and Cape Verde Islands, and Africa southward to Cape Palmas.
52	151	4-1952	THE MEDITERRANEAN, VOL. I, Strait of Gibraltar, Spain, Balearic Islands, northern Africa to Ras Agedir.
53	152	5-1958	THE MEDITERRANEAN, VOL. II, France, west coast of Italy, Corsica, Sardinia, and Sicily, including adjacent islands.
54	153	3-1951	THE MEDITERRANEAN, VOL. III, Southeast Italy, the Adriatic, and western Greece to Akra Tainaron.
55	154A	3-1963	THE MEDITERRANEAN, VOL. IV, Libya, Egypt, Israel, Lebanon, Syria, and southern Turkey, including islands of Cyprus, Rodhos, Karpathos, and Crete.
56	154B	2-1952	THE MEDITERRANEAN, VOL. V, The Aegean Sea.
AREA 6—MIDDLE EAST, EASTERN AFRICA, AND SOUTHERN ASIA			
60	156	4-1951	SOUTHEAST COAST OF AFRICA. Cape of Good Hope to Ras Hafun.
61	157	5-1965	THE RED SEA AND GULF OF ADEN. Includes Suez Canal, Gulf of Suez, Africa north of Ras Hafun, Suqutra, and Arabian coast eastward to Ra's al Hadd.
62	158	5-1960	THE PERSIAN GULF. Includes Gulf of Oman and northern shore of Arabian Sea eastward to Ras Muari.
63	159	4-1951	WEST COAST OF INDIA. Includes Ceylon and Maldive and Laccadive Islands.
64	160	4-1951	BAY OF BENGAL. Calimere Point to Salang Island, including Andaman and Nicobar Islands.
65	161	4-1952	SOUTH INDIAN OCEAN. Madagascar and islands westward of longitude 90°.
AREA 7—AUSTRALIA AND SOUTHWEST PACIFIC			
70	162	4-1951	MALACCA STRAIT AND SUMATRA. Central and western Sumatra and southwestern Malay Peninsula.
71	126	5-1951	SOENDA STRAIT AND WESTERN AND NORTHEAST COASTS OF BORNEO AND OFF-LYING ISLANDS.
72	163	5-1962	JAVA; LESSER SUNDAS; SOUTH, SOUTHEAST, AND EAST COASTS OF BORNEO; AND CELEBES. Excludes western end of Java between Tandjung Tjankuang and Udjung Krawang.
73	164	4-1952	NEW GUINEA. Includes Halmahera and islands southward.
74	170	3-1952	NORTH AND WEST COASTS OF AUSTRALIA. Cape York to Cape Leeuwin.
75	169	4-1954	EAST COAST OF AUSTRALIA. Sydney to Cape York, including islands in the Coral Sea.
76	168	3-1952	SOUTHEAST COAST OF AUSTRALIA. Cape Northumberland to Port Jackson, including Tasmania.
77	167	3-1950	SOUTH COAST OF AUSTRALIA. Cape Leeuwin to Cape Northumberland.

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78	171	3-1952	NEW ZEALAND. Includes Kermadec Islands and islands eastward and southward of New Zealand.
			AREA 8—NORTH AND SOUTH PACIFIC
80	166	6-1952	THE PACIFIC ISLANDS, VOL. III. The south-central groups.
81	165B	1-1952	THE PACIFIC ISLANDS, VOL. II. Santa Cruz and New Hebrides groups, New Caledonia, and adjacent islands.
82	165A	2-1964	THE PACIFIC ISLANDS, VOL. I. Western groups, including the Solomon Islands.
			AREA 9—FAR EAST, PHILIPPINE ISLANDS, AND EASTERN U.S.S.R.
90	78	1-1955	PHILIPPINE ISLANDS, VOL. I. Northern islands, including western Negros and northern Samar.
91	79	1-1956	PHILIPPINE ISLANDS, VOL. II. Central islands, including eastern Negros, southern Samar, and northern Mindanao.
92	80	1-1956	PHILIPPINE ISLANDS, VOL. III. Southern Mindanao, Sula Archipelago, and Palawan.
93	125	5-1957	WESTERN SHORES OF SOUTH CHINA SEA. Singapore Strait to Hong Kong.
94	124	6-1959	COAST OF CHINA. Coast northward of Hong Kong to Yalu Chiang, and island of Taiwan.
95	123B	2-1951	JAPAN, VOL. II (SOUTHERN PART). The Naikai and islands southward, including Nansei Shoto, and Tsushima.
96	123A	2-1951	JAPAN, VOL. I (NORTHERN PART). Honshu, except the Naiki, Hokkaido, Chishima Retto, and Nanpo Shoto.
97	122B	2-1951	SOUTHEAST COAST OF SIBERIA AND KOREA. Sakhalinskiy Zaliv to Yalu Chiang, including Sakhalin.
98	122A	2-1951	EAST COAST OF SIBERIA. Mys Otto Shmidta to Sakhalinskiy Zaliv, including Ostrov Vrangelya.

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